THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVIII. No. 2015.] LONDON, DECEMBER 24, 1901. [53RD YEAR. PRICE 6d.

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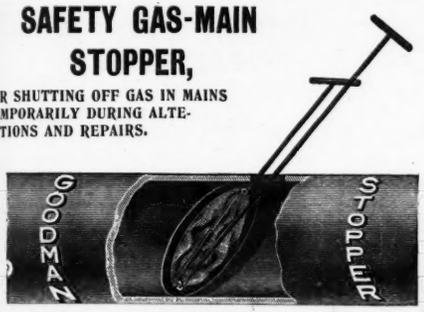

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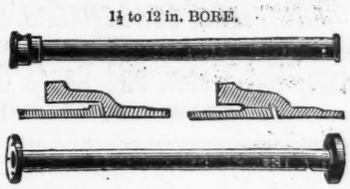

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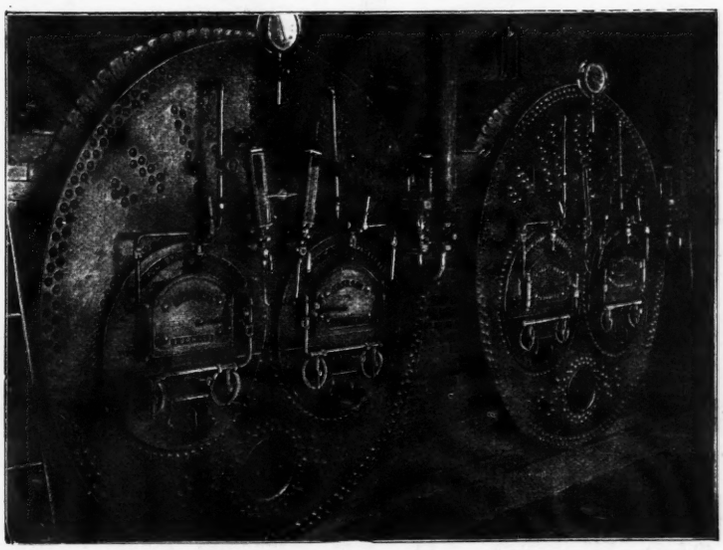

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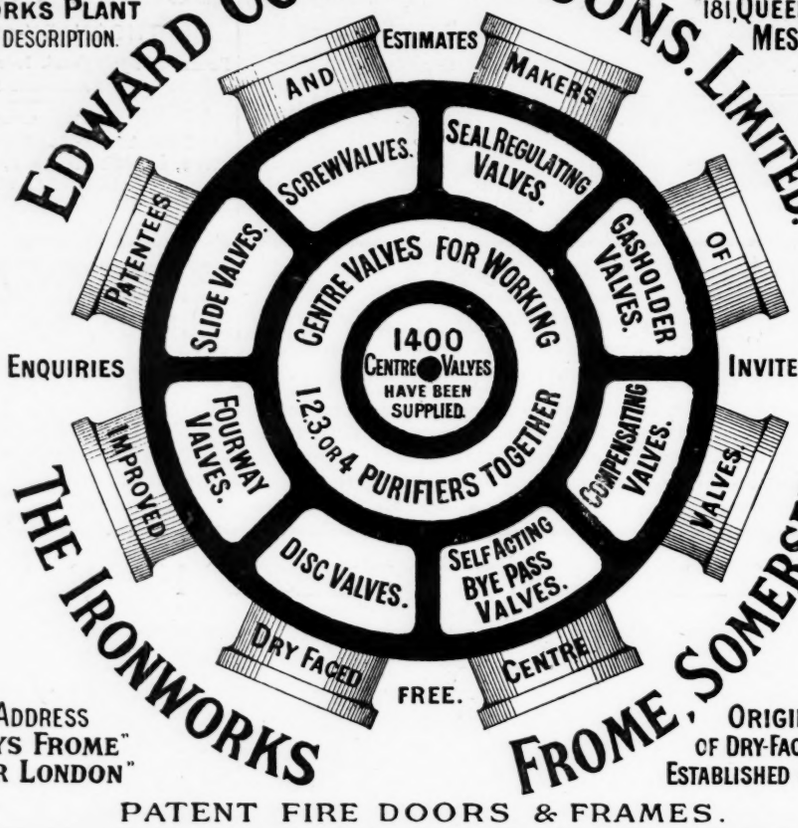

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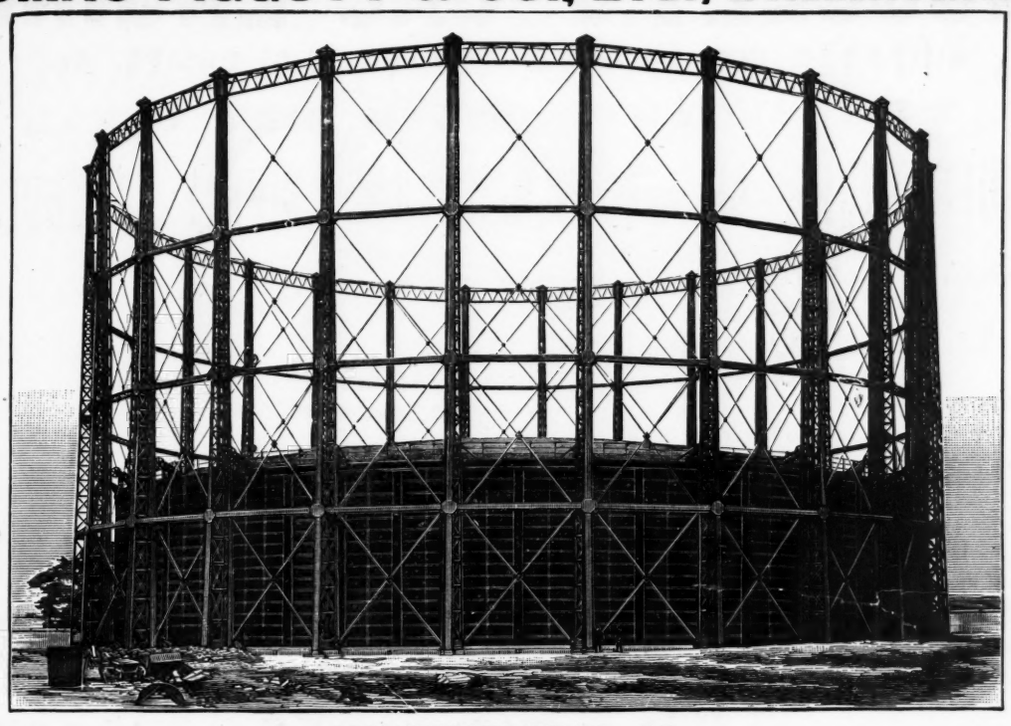

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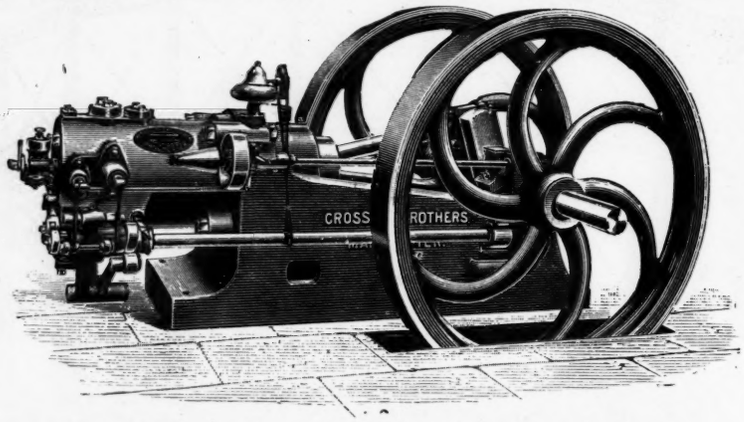

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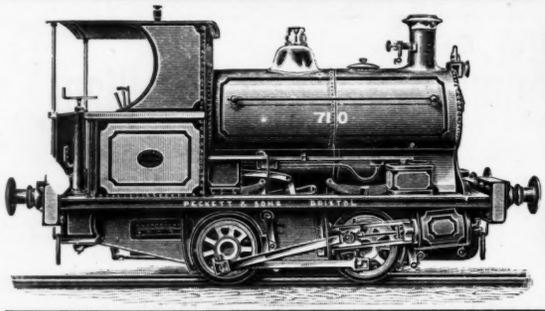

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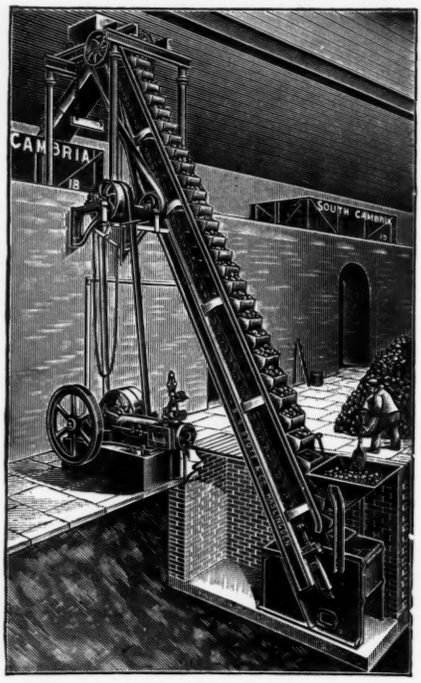

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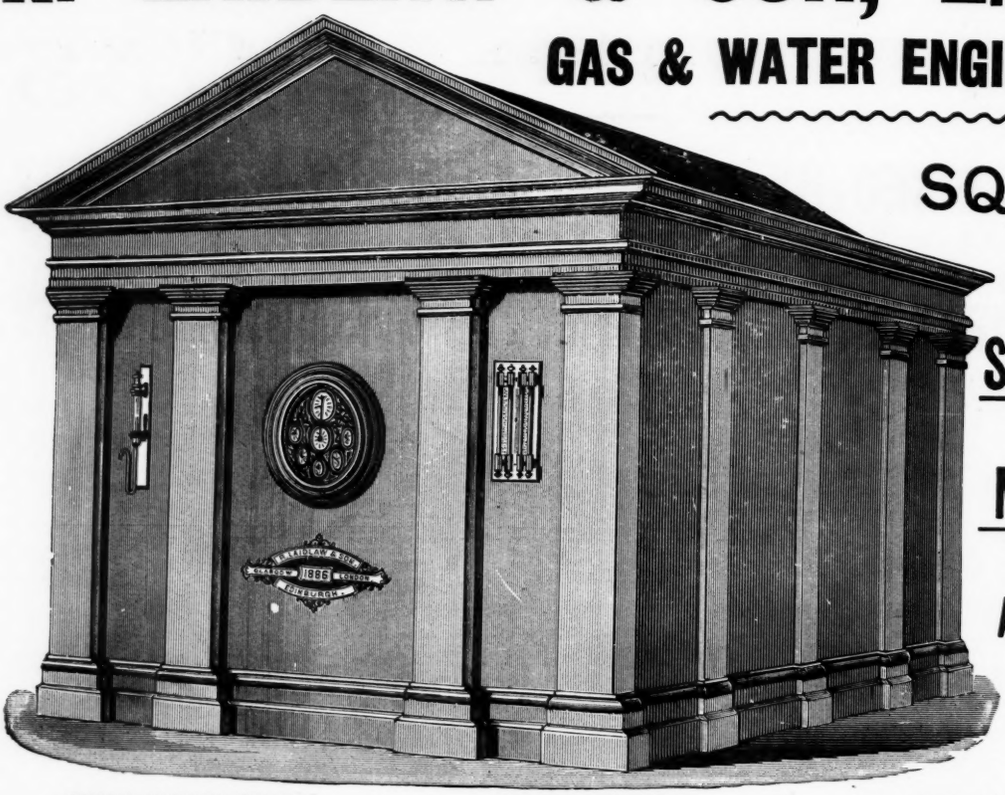

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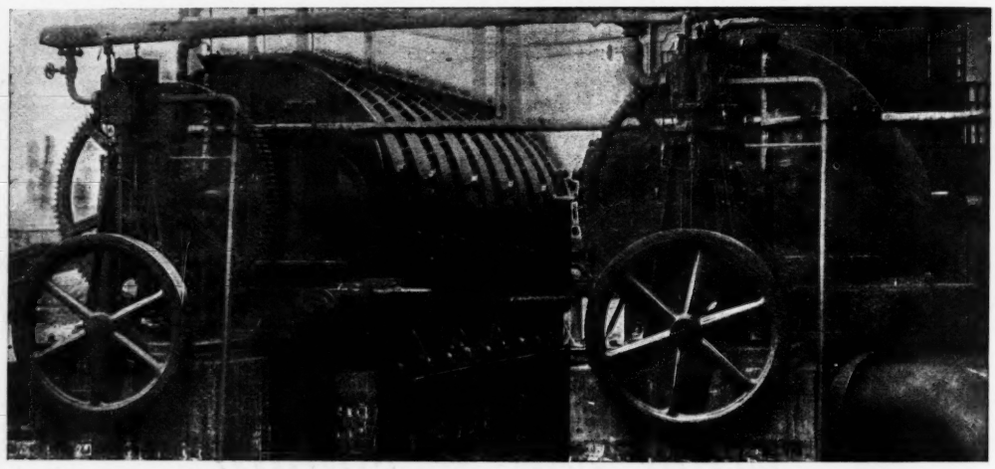

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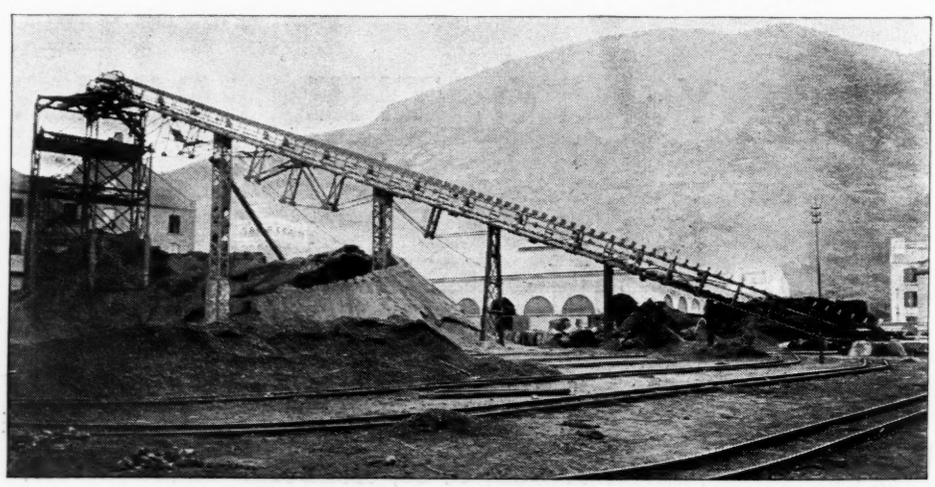

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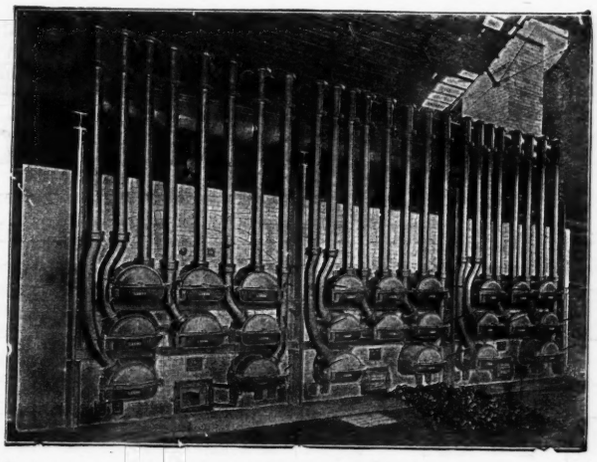

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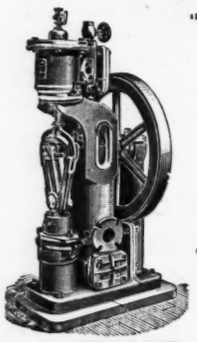

Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 898. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

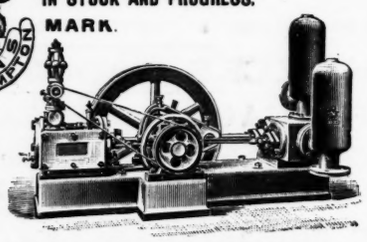

Fig. 635. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 719. "DOUBLE-RAM" STEAM-PUMP.

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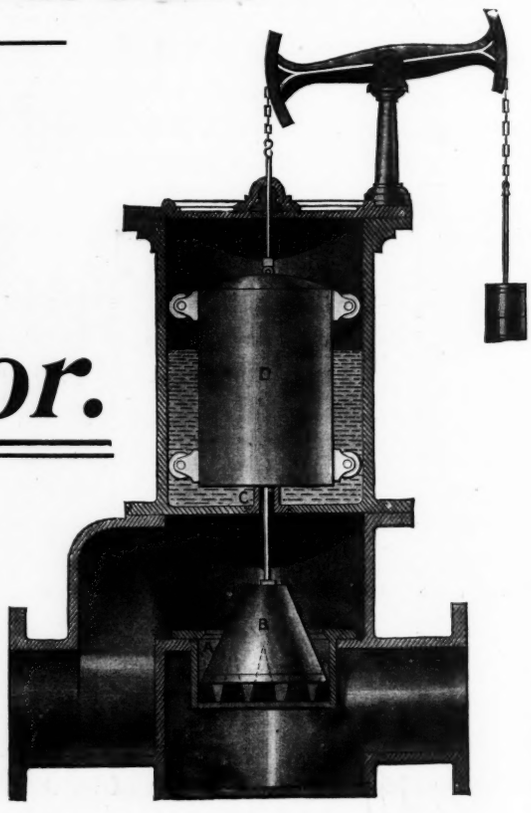

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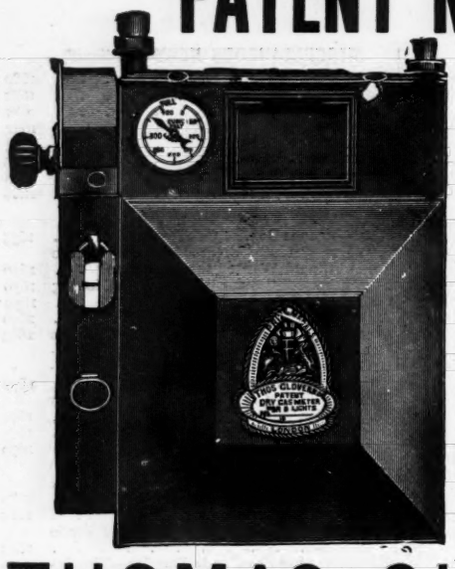

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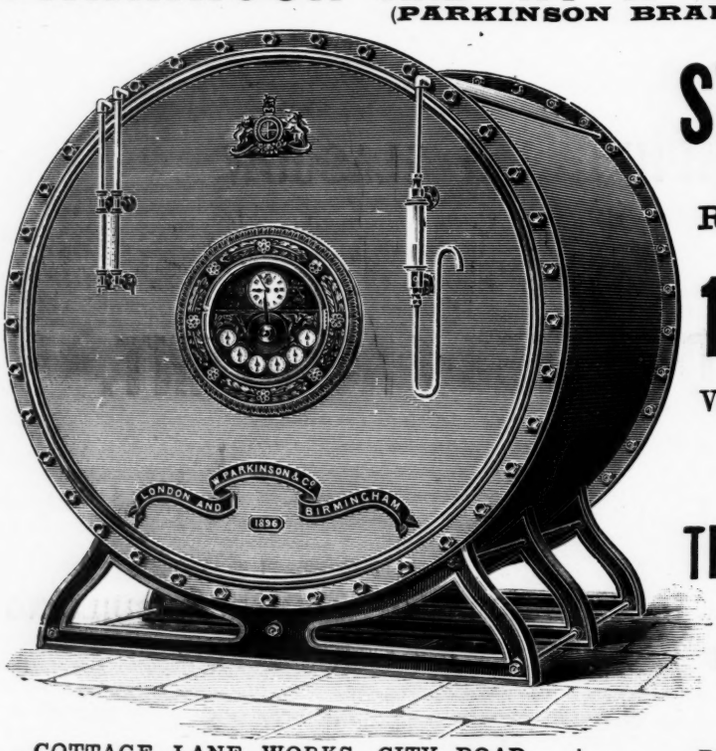

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VOL. LXXVIII., No. 2015.—TUESDAY, DECEMBER 24, 1901.

EDITORIAL NOTES.

Is England Industrially Backward?

ONE of the prominent characteristics of the English people is their trick of self-abasement, to which many popular orators and writers "play up" by vociferating, in and out of season, the inferiority of our native institutions and proceedings in many matters, to those of the intelligent and hypothetically superior foreigner. There are, it is true, some things peculiarly British, which public opinion does not permit to be discussed. Apart from these tabooed matters, the equanimity with which the British public endures the vilification of its methods and manners is truly admirable. We allow Russians to asperse the reputation for humanity of our brethren in arms. We provide platforms for Germans, Frenchmen, and Italians to occupy, with the object of teaching us how to conduct every affair of political, social, and industrial life. It stirs us not to anger when people abuse our systems of education, our coinage, our weights and measures, even our Sundays! It was accordingly quite in order for Mr. R. Percy Sellon to tell the London Chamber of Commerce the other day that, thanks to an abominable legislation, the electrical industries of the United Kingdom are terribly behindhand compared with the volume of such trades in the United States, in Germany, and even in little Switzerland. He said that the capital investment in electricity in the United States is tenfold, and that of Germany fourfold, the similar engagements of this country. He thought this a terrible reproach; and all the papers agreed that the tale is a very sad one. It was not new—only an assertion that poor old England had got left behind again, as usual.

Well, now, speaking for the industry that is more responsible than any other for the difficulty experienced in England by industrial electricity to attain the vogue that it has where ordinary gas is both scarce and dear, it is incumbent upon us to enter a protest against Mr. Sellon's attempt to work upon the recognized foible of English people in the interest of electrical advertisement. The natural weakness in question ought not to be too much imposed upon. If those who abuse it do not remember all the time that the national patience has its limits, they will expose themselves to the same kind of disconcerting awakening that German critics of British war methods in South Africa have recently had to endure. What is this wonderful American and German superiority in electrical investments of which Mr. Sellon speaks? In the former case, it includes very much more "water" than cash. Of course, the United States is a country of a bigness to which the British Isles are as a mere county. Naturally, they want more railway mileage than we do; especially as their roads are nothing to boast of. As a matter of fact, the so-called electrical investment of the United States includes both the real and the inflated value of railways, of gas-works, and of goodness only knows what besides. Moreover, the users of electricity in the United States to-day have to pay interest on all the dead-and-gone capital ever put into cable tramways, "tower" lighting plants, and every other blunder and swindle that has been perpetrated in the name of electrical enterprise since Edison was a telegraph operator and Brush was a carpenter. The Americans can bear all this, for the time being. They have a good deal else to bear; but when the day comes for America to be a poor country, in the sense of having used up all its natural resources, like the Italy of to-day, that poverty will be sore indeed.

As to Germany, which has always had the repute of being a poor land, excessive capital outlay on electricity or anything else is not to be reckoned to its credit just now. The industrial and commercial development of Germany under the Empire has been wonderful; and few of those who have witnessed from outside the lavish outpouring of capital upon this process, can have failed to ask themselves where all the money came from, and what would be the end of it. There is such a thing as being too forward; and that is just what is the matter with Germany in several respects. Electricity is one of these forced growths. This is what the "Electrical "Review" of the 15th ult. said upon the subject; and it should be put against Mr. Sellon's generalities. "General "depression in trade, over-production, excessive speculation, "ruinous competition, and a too numerous creation of mush-"room concerns during the period of high prosperity, are the "leading characteristics of the German electrical engineer-"ing industry at the present time." Of course, engineers do not want to be told that electricity is not a producer, but only an agency for doing work. The sole application of it to production is in the manufacture of calcium carbide; and this has been ridiculously overdone. It is admitted that works for producing the carbide have been multiplied out of all proportion to the demand for the product. The majority of such plants are now lying idle. "France, Italy, "and Switzerland could each alone, if required, supply the "present European demand for calcium carbide." This disposes of Mr. Sellon's reference to Switzerland. But the failure of the carbide manufacture involves that of other interests. "This position of affairs is chiefly due to the past "policy of the large German electrical firms, which have "promoted sub-companies for carbide manufacture, in order "to obtain an outlet for electrical plant and machinery. "The recent failure of Schuckert and Co., of Nuremberg, to "pay the expected 10 per cent. dividend for the year 1900-"1901, is chiefly due to this policy." So this also explains that German forwardness which Mr. Sellon appears to so much admire.

The broad result of all this is that the general industrial situation of the United Kingdom is at the present moment better than that of the countries which have allowed themselves to be over-electrified. We are not free from industrial depression in places; but the displacement of labour in search of employment is scarcely abnormal. It is, at all events, nothing like what is actually being experienced throughout the length and breadth of the Continent, from Russia to Spain, and from Italy to Norway. The shrinkage of capital values in the industries of Central Europe alone, during the past three years, is more than equivalent to the cost of carrying on the South African war, without anything to show for it. The steady pressure of cheap supplies of gas on the British electric lighting interest has kept the latter within reasonable bounds. The cheapness, speed, and convenience of the English railway system has put electric traction upon its merits; while our statutory system has prevented electrical ventures from being imposed, by the mere force of capital, upon British communities, as in America. Cheap gas-engine power in this country has also proved an obstacle to the general adoption of electric driving for machines. Lastly, electric speculation in England, like the heroine of a modern comedy, has "a past;" and while this is interesting, it does not inspire confidence.

Faithless Gas-Works Employees.

OUR "Legal Intelligence" to-day contains a story of faithlessness in the lower ranks of gas workers which will on the one hand open the eyes of gas employers, and on the other, we hope, will act as a warning to employees. The revelation is a grave one; and for the sake of the good name for uprightness borne by the bulk of the workmen of the gas industry, we trust that the shameful turpitude disclosed by our report is circumscribed. The Company who have been wronged by some of their men is the Gaslight and Coke; and there are circumstances which point to a fear that the particular class of corruption which has been revealed may have assumed something of the nature of a malignant growth among a section of the labouring staff of that concern. But if this unfortunately should be so, the Company have taken the right step to stamp out the evil.

A little clerical slip resulted in the discovery of the system of peculation in connection with which Arthur Thomas Purry stood in the dock at the Clerkenwell Sessions last Wednesday. He was charged with the offence of "wilfully, and "with intent to defraud, falsifying certain books and papers "belonging to the Gaslight and Coke Company;" and if there were not unexplained "insuperable difficulties" in the way, he would have been accompanied by a dozen and more confederates. The method of fraud was a clever one; and

even a system of checking did not prevent the subtle intrigue. Purry was a clerk or assistant foreman in the coke department of the Great Cambridge Street works of the Company; and upon him devolved the duty of keeping the final account of the work performed by, and the wages due to, the men who were employed in the occupations of coke carriers, crushers, and loaders. The sacks of coke carried by the men to the coke-crushers were duly registered by a man in what was known as the tally-book; and from that book Purry daily entered into the coke-crushing book, to the credit of each man, the number of tons carried by him, and the total delivered by the gang. Daily the tally-man compared Purry's book with his own; and then appended his signature. But Purry's original figures were only pencilled in; and after the tally-man had attested them, the former increased the totals of the men who were in collusion with him, and for the higher number of tons they were paid at the end of the week. Then the proceeds of Purry's malfeasance were pooled, and equally shared among all who were in the conspiracy. During the four months ending with October, it is clear that the Company were defrauded of about £100 by this one gang; but how long and to what extent the fraud has proceeded, it is impossible to say.

It is pretty clear, however, that these four months do not cover the time, nor the £100 the extent of the losses the Company have suffered by the dishonesty of their servants in this way. After Purry was promoted to the position of assistant coke foreman, he asserts that pressure was brought to bear upon him by the men to carry on this system of fraud which was described by them as a "custom." If it be a custom, the custom is not apparently confined to Great Cambridge Street. Counsel in the course of the proceedings referred to a somewhat similar charge of fraud that has come to light at another works; and presumably he was referring to the one which was the subject of investigation at the South-Western Police Court the previous day, but in this case the material transported was coal. For his treachery, Purry has been sentenced to twelve months' imprisonment; and the accused man in the other case has been committed for trial at the South London Sessions, which will commence on the 8th prox.

One of the unkind, but inseparable, features of these revelations is that innocent men may be brought under the odium of suspicion. But with the confession of Purry before them, and the allegation that this system of fraud is a custom, those in authority in the Company will have, in the interests of those whom they represent and in the interests of purity of service, to investigate, however painful the task may be, how far, if at all, this corruption has worked its insidious way into the other stations of the Company. But, in the meantime, let the fate of Purry act as a warning. Only 25 years of age, and twelve months' imprisonment before him! Some of his kith and kin, including his young wife, were in Court, and they bore the pain of witnessing his degradation. His father and brother have been in the same service for years; and the debasement of the son and brother has brought cruel sorrow upon them. The story is indeed a distressing one. But it must be told for the lesson and caution it presents. While a few are suffering, and suffering keenly, for his misdeeds, many there may be who will be deterred by his downfall and punishment from pursuing the same evil course. If conscience is not sufficient to keep a man honest, then fear of the consequences may supply the deficiency.

The Labour Market.

It is a matter for sincere gratitude that the reaction in trade in this country has not taken place in the rapid, almost sensational, way in which abounding prosperity has given way to acute depression in Germany and in Russia. Nevertheless, though more slowly, that change is taking place in this country, as all the evidence goes to prove. The gradual character of the movement is clearly shown by the returns relating to the state of employment issued by the Board of Trade. In November, 1899, the percentage of Trade Union members unemployed was remarkably low; being only 2·2. By November last year, the percentage had risen to 3·2; while in the corresponding month of the present year it has reached 3·8. This figure is, even then, low compared with the average of the past ten years; so that it will be seen that the decline in trade, though persistent, is gradual.

The iron industry shows a downward movement more decided than is indicated by the foregoing figures. The number of furnaces in blast at the end of last month was 314, compared with 342 last year, and 377 in November, 1899. Employment in most branches of the engineering and metal trades continues to fall off; and the slackening of work in shipbuilding increases, and is likely to still further increase. By this time next year, it is highly probable that there will be a very serious diminution in the volume of employment in the shipbuilding yards; the wretched state of the freight market being most unfavourable to the shipbuilder. This will, of course, involve a decrease of business for the iron and steel makers.

The returns of time worked at the collieries during last month show that not only in South Wales but elsewhere, there was a decrease in time worked. The "average number of days worked per week" by the collieries reported upon in the four weeks ended Nov. 23, as stated by the Board of Trade, was less than in the preceding four weeks, and less also than in the same period last year. But the figures given convey no accurate impression of the time wasted by the colliers; the statistics being based upon the hours during which the pits are in work, regardless of the number of men at the coal face. It is somewhat characteristic of the Labour Department of the Board of Trade that, in the special report for the past month on the coal trade, no reference is made to the stop-days ordered by the men's leaders in South Wales. The district report for South Wales says: "Collieries generally are working full time throughout the district." "Full time" apparently means two days' idleness out of twenty-four!

The returns for November and for the eleven months show that considerable reductions in wages have taken place. These have chiefly affected the coal miners and iron workers. Altogether, nearly one million hands have sustained a net decrease of about 1s. 7d. per head in their weekly wages. This, however, compares with an increase of more than twice that amount in the same period of last year; so it will be seen that, viewed from any point, the decline in the position of labour is proceeding gradually. We have not yet got the "unemployed" problem seriously to consider again; though there can be little doubt that it will not be a long day before the question once more comes into prominence.

The "Slot" Meter as a Life-Saver.

The ease with which people can avoid seeing what is perfectly obvious, and the lack of the sense of proportion which is so often the source of trouble and weakness in the conduct of human affairs, are not so conspicuous in any relation as they are in respect to conditions affecting public health and safety. Take, for example, the fuss that was made over the supposed increased risk to life due to the introduction of carburetted water gas, and the similar agitation that was worked up concerning the low flash-point of American kerosene. How many of the persons who were more or less interested in these matters paused to ask themselves a question as to the scale of the imputed hazard? Coroners are the right order of public officials to see the life-risks of the community in their true magnitudes and relations. Regarded in the cold light that prevails in Coroners' Courts, some of the most impressive of the hazards of modern life sink into comparative insignificance beside others which are too common to attract the notice due to their importance. Thus it is almost surprising to learn, on the authority of the Coroners of England and Wales, that one of the most serious dangers to the infant population of the country is the common habit of leaving children shut up in rooms with an unguarded fire. The Home Office has taken notice of the statement; and it is understood that means are to be arranged to bring upon those who perpetrate this negligence some adequate punishment for their action. Of course, when one thinks of it, the number of burnt children whose sad fate is duly reported in the newspapers must be considerable. As a matter of fact, there were 1425 such cases, directly attributable to the absence of a proper fireguard, in the years 1899 and 1900. These fatalities are of the class that is not dealt with by news agencies, any more than runaway horses. Consequently, newspaper readers do not get a chance of seeing the whole of them.

While we are upon this topic, it is highly gratifying to be able to remark upon the absence of any fatal consequences from the general introduction of gas-burners and stoves into the dwellings of the poor by the agency of slot meters. When this movement was begun, there were not lacking pessimists who foretold all sorts of disasters from the placing of gas at the command of those who had had no

experience in its use, and are notoriously careless in their domestic habits. It can now be claimed justifiably that such prognostications of evil have been completely falsified. The cottage population may not have had any opportunity before of learning to use gas on their own account; but everything must have a beginning, and they know all about it now. Besides, most people of this class have experience of gas in their capacity of working people and domestic servants. They certainly appreciate its convenience and safety; the latter quality being very conspicuous. It is worth bearing in mind, in this connection, that the automatic cessation of the flow of gas through a prepayment meter when the limited quantity paid for has run out, must be an additional safeguard. If a user of gas by this means were to so far forget himself as to blow out a flame in his bedroom on retiring to his hard-earned rest, the meter would soon pass the balance of his pennyworth; and there would be an end of the danger from this source. The benefits of civilization are so commonly attended by new and additional risks to life and property, that it is quite a relief to signalize the slot meter as a notable exception to this rule.

The Comparative Rating of English Towns.

THE eagerness of the search after the union of municipal economy with efficiency, is illustrated by the labour that is being devoted to the collection and analysis of rating statistics. Mr. James Carter, Borough Treasurer of Preston, has for several years compiled a tabular statement of the rates levied and collected in various towns, which he publishes in the local newspaper, whence the information is borrowed (not always with proper acknowledgment), and adjusted to serve various and sundry purposes. The comparison of local rates is a very elusive study. The student usually goes into it with the object of ascertaining how a particular example of rating, in which he is personally interested, compares with others. Sometimes he wishes to make it out to be the highest, sometimes the lowest, and not infrequently he desires to find it about the average figure. Singularly enough, those who go about it in the right way, can generally obtain all the support they require for their preconceived views from the available figures. Extreme examples can be ruled out, or the significant places can be carefully selected. Thus, the partisans of municipal trading for profit will be sure to hunt out the cases where the gross amount of the rates is relieved by subsidies. It would be as pertinent to classify rating by the length of the names of the towns, or to show that towns beginning with B are more heavily rated than the others. For the actual cost of local government to the ratepayer depends, of course, as much on the amount of the assessment as on the rates; and this prior consideration never transpires. The rates in a certain town may be 8s. in the pound, as against only 6s. elsewhere; but if the ratepayer can get premises in the former for £50 a year which would cost him £75 a year in the latter, it does not require much arithmetic to show where he will get off the easier. It is impossible to compare rates unless the conditions are strictly comparable; and it would not be easy to name two English towns alike in all pertinent respects. A good many matters would have to be cleared up before the money test could be fairly applied to the executives of any two towns.

The Cause of Municipal Purity.

THERE was a tremendous hubbub at last week's meeting of the London County Council, when some of the independent members said nasty things about the Works Department of the Council, and the connection between the workpeople employed by the Council and the Labour Bench of this body. A remark that the latter resembled so many "linnets "waiting to be fed" proved to be particularly galling to the notables referred to; it would be difficult to surmise why. The present majority of the Council is so abjectly slavish to the Trade Union whip, that the working-class interest has its own way in everything. Meanwhile, it is almost comical to see the anxiety displayed throughout the country to neutralize whatever shareholding interest there may be among the holders of municipal office. In one place, which need not be named, there was appended to a recommendation of a Committee that a tender should be accepted, a minute stating that the Mayor and two of the Councillors (being shareholders in the tendering Company) had not voted on the question. When the business came forward in the Council, the shareholders not only abstained from voting, but also refrained from speaking on the subject.

At the meeting of the Blackburn Town Council on the 5th inst., a resolution was moved, in accordance with notice —"That we do not allow any official of this Corporation to "hold shares, or have any monetary interest, in any firm "or company doing business with, or likely to do business "with, this Corporation; and, further, that we do not con-"sider it honourable or just to the public that any Coun-"cillor or Alderman should hold shares, or have any mone-"tary interest, in any firm or company doing business with "this Corporation—it being distinctly understood that this "resolution shall not apply to railway or telephone com-"panies." The mover of the resolution explained that he did so because he believed the existing law is not strong enough to protect the public from jobbery by their representatives and officials. A counter-resolution was carried declaring that "the Council see no sufficient reason to put "upon the actions of their members or officials any limita-"tions beyond those imposed by law." The hypocrisy which is believed by foreigners to be so large an ingredient in our national character takes many developments; and it will not be improved by being municipalized.

Thorium and Cerium.

THE "Ironmonger" has just completed a series of original articles, which are reprinted in our contemporary's "Diary "for 1902," upon the technics of incandescent gas-mantle manufacture. Although so much has been written and said about the Welsbach invention, in its original, transitional, and present stages, there is reason to believe that many even among gas engineers have but the haziest notions of what a Welsbach gas-mantle really is. We have no intention of robbing our esteemed contemporary of its special information, and shall therefore commend to the periodical itself such of our readers as may be curious to know what the "Ironmonger" has to say on Welsbach matters. What we are at liberty to touch upon, however, is the information offered as to the wide-reaching influence of Welsbach's use of the "rare earths" on the chemistry and the commercial aspect of these once recondite materials. Their generic name has become a misnomer. The exact study of the so-called rare earths has enormously benefited chemistry, and has strengthened the fine generalization known as the periodic law of the elements. It has also furnished physical science with fresh data, and given a new impetus to the investigation of the mysterious connection between heat and light. "Even to the lay mind, the incomparable brilliancy of "the sun is rendered more easy of comprehension by the "discovery of new materials which are capable of such "intense incandescence at comparatively low temperatures; "and the distinction between 'light' and 'burning' has "been made more clear." From the commercial point of view, a most remarkable effect of the enormous activity of the chemical industry of the rare earths during the last few years is the reduction of the market value of the chief product of this industry—thorium, in the form of nitrate. Somewhere about 1000 tons yearly of commercial monazite sand is exported from Brazil to Europe—representing from 4 to 5 per cent. of oxide of thorium. The price of the monazite sand has fallen from £50 to £12 10s. per ton during the past five years; while "the price of thorium "nitrate has fallen rapidly and continuously, until the salt "fetches little more than 1 per cent. of the price six years "ago." Last year it was listed in Germany at 8d. an ounce; whereas in 1894 the price was 57s. an ounce. There is a superfluity of cerium salts after the reduction processes—so much so, that "the superoxides of the cerium group have "found employment as a rust protector (*sic*), and especially "as a marine paint." It is to be presumed that the writer means that cerium superoxides are a protection against the rusting of iron, and consequently are useful as a pigment in preservative paint. What a "come down" this seems for all the cerium but the 1 per cent. which goes with the thorium to make the mantle with the highest known efficiency as an illuminant! Who would imagine that the brilliant radiant of the most improved street lamp may have a "poor relation" doing unobtrusive duty with the paint on the lamp-post?

Blast-Furnace Gas for Gas-Engines.—On Monday last week, an installation of engines worked by blast-furnace gas was started at the Clay Cross Iron-Works near Chesterfield. They are each of 450-horse power, with cylinders 27 inches in diameter and 30-inch stroke, and are worked on the Otto cycle principle. They run at the rate of 160 revolutions per minute, and will supply blast for the furnaces.

WATER AFFAIRS.

Charge for Water for Public Purposes.

THE proceedings at the Highgate Petty Sessions last Wednesday, which will be found reported in another column, show that the relations of the Barnet District Gas and Water Company and the Finchley District Council are not of the most amicable character. The Council require water for the purpose of flushing their sewers and drains; and as they objected to the price charged by the Company, they applied to the Magistrates to have the figures settled by them, under the provisions of section 37 of the Water-Works Clauses Act of 1847. The Company, by their Act of 1883, have to supply the East Barnet Valley District Council with water for public purposes at 1s. per 1000 gallons; but they are exempted from supplying at all when the district lies at a greater height than 300 feet above Ordnance datum. The Finchley district is in this position; but instead of withholding the water the Company provided it at an additional charge of 3d. on the East Barnet rate, making 1s. 3d. The Finchley Council, however, thought the Company could supply them at 9½d., and make 25 per cent. profit. The Company's Counsel showed that for the past three years the average cost has been 7¾d., 25 per cent. on which would bring the figure up to nearly 10d.; while if they paid their statutory dividends the rate would be 1s. 5d. He directed the attention of the Bench to the fact that the whole of the water has to be pumped, at great expense, from wells; and that when the Company have run short, owing to severe drought, they have had to pay 1s. per 1000 gallons for an auxiliary supply. Probably the most interesting feature of the case was the contention by the Company's Counsel (Mr. Foote, K.C.), that the Court had no jurisdiction in the matter submitted to them, inasmuch as, under their Private Acts, the Company were relieved of the obligation to furnish a supply of water under pressure—that, in short, the General Act of 1847 was overridden by the later enactments. The Bench were rather puzzled; and the Chairman (Sir John Glover) frankly confessed that the question was the most difficult one he had ever been called upon as a Magistrate to settle. In the result, he and his colleagues decided against Mr. Foote on the point he had raised, and fixed the price at 1s. 2d. The Council therefore have the satisfaction of knowing that they have saved the ratepayers 1d. on every 1000 gallons of water used for flushing the sewers. They were evidently anxious for a fight, as is indicated by their refusal to come to an arrangement with the Company, and their hostile attitude towards them in exceptionally trying circumstances. It is to be hoped they will not come to consider that their brilliant victory has been too dearly bought.

The Self-Purification of Streams.

THE subject of the self-purification of streams, which, it will be remembered, was brought under the notice of the delegates at the Sanitary Institute Conference, is one which admits of almost unending discussion. Believers in this application of the principle of the *vis medicatrix naturæ* used to declare that, after a few miles' run, water into which sewage had been discharged became comparatively harmless. On the other hand, there were ardent sanitarians who boldly postulated, as we remarked a few weeks ago, that no river was long enough to purify itself; and this dictum was accepted without question by a number of people as the final word of science on the subject. It must be acknowledged that they were to a large extent justified by the results of bacteriological research, which had thrown a flood of light upon many points previously obscure. Against these results must be placed data which have been accumulating on the other side, and which apparently indicate that, under certain conditions, streams certainly do tend to become purer as they flow.

A noteworthy instance is furnished in a report lately issued by the Illinois State Board of Health on the investigation conducted under their auspices into the sanitary condition of the Illinois River and its tributaries, with special reference to the effect of the sewage of Chicago on that river and upon the adjacent Des Plaines River, prior to and after the opening of the Chicago Drainage Canal. The work was carried out for the Board under the direction of Dr. John H. Long, Professor of Chemistry in the North-Western University Medical School, and Mr. Jacob A. Harman, a civil engineer of Peoria; and their labours as well as those of their assistants, were briefly noticed by Mr. G. C. Whipple a short time since in "Science." The most interesting feature is naturally the comparison of the condition of the Illinois River before and after the opening of the canal. For many years the bulk of the sewage of Chicago was discharged into the river, which flowed, by north and south branches, into Lake Michigan. This was regarded as a menace to the public water supply, which is drawn from the lake. Various remedial measures were tried, and eventually the canal was opened early last year. Since then, the actual bulk of sewage sent westward has increased; but the amount of water has augmented in far greater ratio—the law requiring a minimum flow of close upon 2 million gallons per minute. According to Dr. Long, this increased dilution has resulted in an improved condition of the water in the Illinois River, regarded from a sanitary point of view. But the portion of the Doctor's report which is of special value in connection with the subject now under consideration is that in which he expresses the belief that if the whole of the sewage of Chicago were to be excluded from the Illinois River, the condition at Grafton, where it enters the Mississippi would remain unchanged, "so far as its organic "contents and bacterial organisms are concerned." It was thought that this statement should have a reassuring effect upon the dwellers in the Lower Illinois Valley, and those who feared the possible effect of the sewage upon the water supply of St. Louis.

A "Memorandum" on the Mond Gas Scheme.—One of the most important features of the past session, so far as the gas industry is concerned, was unquestionably the passing, after an inquiry extending over sixteen days, of the Mond gas Bill—now the South Staffordshire Mond Gas (Power and Heating) Company's Act—which, as our readers know, sanctions a scheme for the distribution of power gas over a large area in the Midlands. As this may lead to the introduction of other schemes of a like character, it behoves gas managers, and others connected with gas supply and legislation, to make themselves thoroughly acquainted with the provisions of the Act. In doing this, their labours will be greatly lightened by a pamphlet which has been prepared by Mr. F. N. Keen, of the Middle Temple, and, as will be seen by an announcement appearing elsewhere, is being issued from the office of the "JOURNAL." It is entitled "A Memorandum on the Mond Gas Scheme;" and it contains an abstract of the principal provisions of the Act, with a classified summary of most of the points urged in favour of and against the Bill during its progress, and an outline of the main features of the scheme as they appear in the minutes of evidence. These are followed by a number of miscellaneous matters in connection with existing gas undertakings which came out in the course of the evidence, and are of importance to all who are studying this question. Dates and pages of the printed minutes at which the various matters will be found dealt with are added for purposes of reference.

A Diluent Wanted for Acetylene.—Mr. A. E. Munby has recently written a letter to "Nature" on the dilution of acetylene for heating purposes. This appears to be a matter in which the writer has interested himself for some little time, and as to which he remarks that this use of the gas is extending and is likely to increase. The combustion of a gas containing 92 per cent. of carbon by means of an atmospheric burner, is not more easy than its combustion to produce a trustworthy luminous flame. The chief difficulty lies in the relatively high pressure under which the gas must be burnt. No one has yet devised a bunsen burner for acetylene which will give a flame large enough for working purposes under a pressure of less than 6 inches of water; and even then luminosity is not entirely banished. This leaves no margin for incorrect adjustment of the burner. The excessive pressure, too, is for several reasons objectionable. That the luminosity trouble is partly a matter of temperature, is shown by heating the tube of a non-luminous bunsen, or pouring water upon the tube of one showing luminosity; the effect being very striking. Mr. Munby suggests, however, that, in order to get to the root of the matter, it will be desirable to dilute the acetylene to begin with. This dilution, it is proposed, should be by the addition of some other carbide to the calcium charge, with the object of getting methane or hydrogen among the products of decomposition. This expedient has so far proved impracticable. Failing a suitable carbide, Mr. Munby asks if some organic chemist will not come forward with a bye or waste product which will decompose in the presence of the hot caustic lime produced in the generator, and make a diluent gas of some sort—its nature apparently indifferent. Investigations are wanted to show the amount of diluent required to banish the luminosity of acetylene under some standard conditions. Mr. Munby can only speak of carbon dioxide. A bunsen burner consuming 1 cubic foot of acetylene per hour under 6 inches water pressure, showing a fully developed luminous zone rather greater in diameter than the sum of the widths of the non-luminous zone on either side, requires a supply of carbon dioxide at the rate of 0·15 cubic foot per hour to completely destroy this luminosity.

ESSAYS AND REVIEWS.

THE VIENNA MUNICIPAL GAS-WORKS.

(*Continued from p.* 1589.)

Starting Manufacture and Distribution.

STARTING the new works and bringing the new distributing system into operation at a definite date in the busiest season of the year, coupled as it was with the necessity of transferring the meter connections at the same time, was a task such as has never before been required on such a scale of the technical staff of any gas-works. It was, however, much lightened by the transfer to the Municipality of the meters belonging to the Imperial Continental Gas Association, already referred to; and for the most part the work on the consumers' premises consisted merely in making simultaneous reading of the indexes, and in closing the tap on one service-pipe and opening that on the other. The work of changing over the meters was actually begun on Oct. 25 and completed on Dec. 24, 1899; while the final cutting out of the service-pipes of the Imperial Continental Gas Association was finished by Feb. 24, 1900. There were 58,200 meters transferred to the Municipality; and forty parties of workmen and officials were engaged daily in effecting the change of supply.

Hitherto when gas-works plant and mains have been first of all brought into use, gas has been directly introduced into them. But the great size of the Vienna installation, with the consequent multiplication of the risk of explosion owing to the formation of explosive mixtures of gas and air in the mains and plant, led to an endeavour being made to avoid such risks. Evidently there would be no danger of explosion if gas and air were not allowed to mingle in the apparatus. The idea of filling the distributing system with carbonic acid, was given up in deference to technical opinion. An original proposal of Dr. Murmann, of Vienna—to interpolate a buffer of carbonic acid between the air in course of expulsion and the inflowing gas—revived, however, the notion of completely displacing the air before admitting gas. It was finally decided, on the strength of favourable reports from Herren Bunte, Tieftrunk, Schwackhöfer, and Strache, to use gaseous products of combustion, or chimney gases, made for the purpose by Dr. Strache, to displace the air completely in the distributing system and gas-works plant before introducing any coal gas.

The chimney gases were produced in a small plant consisting of a fan, a generator lined with fire-brick (of $17\frac{3}{4}$ inches inside and $33\frac{1}{2}$ inches outside diameter), a recuperator, a dust-catcher, and a washer. Charcoal was consumed in the generator. The gases had a specific gravity of about 1·1, and, consequently, were but little heavier than air, in which respect they had a great advantage over carbonic acid. In order to prevent the formation of carbonic oxide, the combustion of the charcoal was systematically carried on with an excess of oxygen, amounting at the most to 3 per cent. This excess of oxygen was too small to give rise to any possibility of an explosive gaseous mixture occurring. The chimney gas mixture consisted essentially of nitrogen, carbonic acid, and a small proportion of oxygen, in addition to aqueous vapour. A strong odour was imparted to it by means of carbylamine and camphor. It was collected in one of the four gas-holders, and driven thence into the apparatus, works mains, and distributing system. The cubical content of the distributing system was about 2,000,000 cubic feet, and that of the works mains and the crowns of the holders about 1,130,000 cubic feet; so that there was in all about 3,130,000 cubic feet of air to be expelled. Some 6,780,000 cubic feet of the chimney-gas mixture was made; so that there was available fully twice as much as the volume of air it was to expel. The cost of the mixture amounted to a little over 2s. per 1000 cubic feet, including capital charges on the generating plant; and of this amount, about $8\frac{1}{2}$d. was the cost of odorizing it.

A detailed programme was drawn up for starting work in the proper sequence and manner; and a commencement was made on Aug. 14, 1899, by lighting up one bench of retorts in order to make the gas required for filling the mains, &c. From Sept. 25, 1899, one bench more was lighted up each day, in order to be in readiness to begin to take over the private consumer supplies from Oct. 25. It required 26 days' gradual heating to bring each setting to the proper heat for working. After the apparatus and works mains had been filled with chimney-gases, coal gas was first made on Sept. 14, 1899; and the yards of the gas-works were lighted with the gas on Sept. 15.

An exhaustive examination of the distributing system and services for leaks and fractures was commenced on Aug. 14, 1899, in order to avoid the danger which would necessarily arise from them if existing when work was actually begun. The blowing out of the air in the mains was done in sections; and as the chimney-gas mixture was heavier than air, it was introduced at the lowest points in the distributing system, and the air discharged at the highest points. This method was reversed when coal gas was introduced, and the chimney gases expelled. For this purpose, blow-off pipes were fixed, reaching nearly to the bottoms of the principal mains, in open spaces near the gas-works; and provided with valves, and double insertions of wire gauze, to avoid any possibility of the flame striking back in case the escaping gaseous mixture should be accidentally ignited. Similar blow-off pipes, of $1\frac{1}{2}$ to 2 inches diameter, were fixed at various points on the limits of the system, and at a few open spaces in the city.

A start was made with filling the trunk mains with chimney gases on Sept. 24, 1899; and four days later coal gas was introduced in the more elevated districts, and gradually extended to the low-lying ones. Thus there was maintained between pipes filled with air and pipes filled with gas a considerable length of pipes filled with chimney gases. On Oct. 13, 1899, the batswing burners to the number of 21,000, which had been used to burn off the inferior gas, were partially replaced by Welsbach burners; and all of them were replaced by Oct. 25, 1899. From that date, the whole installation was in working order; and all was brought into actual operation without any serious mishap.

The account of the new Vienna Gas-Works, prepared by Herr F. Kapaun, the Engineer, at the request of the Burgomaster, which has been followed closely—though necessarily somewhat abbreviated—in the foregoing series of articles, comes to a conclusion with this description of the way in which work was commenced. The preparation of the articles has been greatly facilitated by the diagrams and plans, for which the Municipal Authorities of Vienna most courteously furnished us with the necessary blocks.

Those readers of the "JOURNAL" who have followed this description of the new Vienna works, will be interested to learn a few particulars of the first year's working; and we propose to devote a supplementary note to this matter.

ELECTRIC LIGHTING MEMORANDA.

Lord Avebury on Municipal Trading in Electricity.—Mr. R. Percy Sellon on the Electric Lighting Acts and English and Foreign Electrical Enterprise.

ELECTRICIANS are now with one accord abusing the Electric Lighting Acts, which have kept a good many of them alive the past ten years and more, and still find daily bread for a considerable number of worthy and clever professional gentlemen, who, without this support, would be compelled to find other occupation. The latest voice raised in this strain of reviling is that of Mr. R. Percy Sellon, the Chairman of the Electrical Trades Section of the London Chamber of Commerce, who, on Wednesday last, delivered an address before a special meeting of members of the Chamber, on British electrical industry and the need of revision of the special statutes under which some of its branches are carried on. Lord Avebury presided, and improved the occasion by severely criticizing the modern fashion of municipal trading, which he declared would be found to be usually carried on at a loss, if the accounts were correctly kept and all the proper expenses fairly counted in. It is, indeed, very remarkable that members of local authorities so frequently lend themselves to this practice of deceptive book-keeping. They cannot, or will not see, apparently, that what is done in this way in order to enable a municipal department to show a profit, is precisely analogous to what any person does who occupies his leisure time in working in his garden or carpentering. He may not charge himself anything for his time; but it has a value all the same—the price, that is to say, which would have to be paid to another man to do the same work. In the same way, municipal electricity is usually treated as a "home made" article, and is not charged with many very real expenses, which nevertheless exist, and are borne by something else.

Mr. Sellon found fault with our "restrictive legislation," for what he described as the backwardness of British electrical applications. He sang the old song about the forwardness of the United States, Germany, and Switzerland—countries which, he said, "had taken full advantage of the possibilities of electrical science." He did not say a word about the dearness of gas in these countries, or the natural water power advantages of Switzerland. Nor did he breathe a syllable about the scandalous riot of speculation which in England preceded the passing of the Electric Lighting Act, 1882. How absurd it is to misrepresent recent history in this way! Mr. Sellon declares that the Act of 1882 "proved practically fatal to the introduction of electricity supply;" whereas it was notoriously the Brush "trading" of the period that stopped the flow of capital into this business. After some years, when enterprise began to rise languidly from the wreck of the Brush companies, and a new order of adventurers having the benefit of the honest and capable advice of men like Dr. Kennedy and the late Dr. Hopkinson were found willing to make a fresh start with another sort of electric lighting, the stringency of the first Act was relaxed, and the 1888 Act became law. It is all very well to point from the comparative smallness of the actual British capital investment in electric light and traction, to the similar investment in the United States; but nobody has yet indicated how much of the latter is "water."

It is perfectly certain that if it had not been for the much-abused Act of 1882, electricity supply in England would have been burdened for evermore by the waste of the Brush gamble of those days. It ought not to be forgotten that all the monstrous inflation had collapsed, and the remains cleared out of the way by 1888. The principle of the Electric Light Acts is admittedly the same as that of the Tramways Act, 1870. It is open to be

argued that this principle has its disadvantages; but it does not lie in the mouth of anyone concerned in the electric light business to complain of a scheme of legislation under which scores of municipal electricity supply undertakings have been established in localities where never a penny of private capital could have been had for such a job. Trading electricians were quite content with the Acts so long as one municipality after another kept rushing in where the boldest speculator feared to tread. Now, there is some slight alteration of the circumstances. Electricity supply "in bulk," and electric traction on a large scale, are objects to conjure with, to the admiration of country clergymen and spinsters with money to invest. Not that there is any great eagerness on the part of the investing public to put cash into such ventures; but still, they might do it if the schemes could be made to look imposing enough. Unfortunately, those wretched municipalities which have gone into electricity supply on their own account spoil the game. They object to make way for supplies of electricity in bulk, and protest that, if this is wanted for any really paying purpose, they can supply the demand themselves. Hence these tears. Nobody knows better than Mr. Sellon that it is idle to criticize English electrical enterprises in the light of foreign statistics. This country has its own standard of quality in such matters, as well as its own geographical limitations. The principle of the Tramways Act may be good or bad for the public interest; but at any rate, it deserves to be criticized in general terms, not vilified because it conflicts with a particular phase of a single trade interest. One is at a loss to understand how the Electric Lighting Acts can be fairly accused of checking the electric lighting trade, when there are in existence many more undertakings than can possibly pay their way.

A MANUAL OF COMMERCIAL KNOWLEDGE.

THE need of some kind of "secondary" education for boys intended for commercial life—some course of instruction in the special branches of knowledge likely to be of use to them in the particular section of the commercial world which they are to enter, to follow upon a thorough grounding in general knowledge—is becoming more and more widely recognized; and the facilities afforded for obtaining this commercial education are on the increase. Much, however, remains to be done; and not least are needed carefully and specially prepared text-books upon the general principles of business—as distinct from text-books upon special industries—which books must be designed with the view of affording instruction to youths who have had no experience of commercial life. This is not an easy task; but that it is not impossible of achievement, is proved by the publication of a book which we have before us, entitled "Commercial Knowledge," by Mr. Algernon Warren (John Murray). This little work, of some 250 pages, contains a wonderful amount of accurate information, some of it of no little value to those engaged in business, yet all conveyed in language so plain and non-technical as to be intelligible to the novice in commercial matters. Any boy of fifteen or sixteen who is ever going to be any good at all in business, should be capable of learning much from Mr. Warren's book.

The author remarks that, hitherto, it has been assumed too commonly that the intricacies of commercial routine are altogether beyond the comprehension of the young, and that, consequently, we have been content to instruct our youth in the comparatively rudimentary requisites for a commercial career—hand-writing, arithmetic, the elements of book-keeping (generally taught, be it said, by some master who never kept a ledger in his life, in a way calculated to convey the minimum of meaning with the maximum of distaste for the science and practice to the student), with perhaps shorthand, and a very moderate amount of foreign languages. Such a training, even when really satisfactory in itself, is too elementary to serve any practical purpose; something more is wanted to equip a lad for entry into business life if he is to attain to a position of usefulness at the earliest possible date. A course of instruction by a qualified instructor—who should have had practical experience of commerce—based on Mr. Warren's book, would do much to make that equipment complete.

After explaining the nature of commerce, and the control exercised over, and the assistance rendered in, its transaction in this country by the Government, through the Board of Trade, and the Foreign and Colonial Offices, the author proceeds to explain the meaning of the law of supply and demand, and of what is meant by "dull" or "active" markets, "forced sales," dealings in "futures" and so forth—all of which information is given with a simple but intelligible brevity that is most commendable. The meaning of, and the arguments for and against, free trade and protection are briefly and impartially set forth; and the law relating to partnerships, the difference between wholesale and retail trading, the elements of company law, and the nature of syndicates and trusts explained. A brief account of the legal relations of principals to agents, and of the necessity for, and usual character of, "bought" and "sold" contracts, precedes a chapter on book-keeping that could be most usefully studied by a pupil in conjunction with a practical explanation of actual books of account by an experienced book-keeper. Nothing is more difficult to teach satisfactorily by means of books alone than book-keeping. Personal instruction can do more in an hour than study can do for a learner in a week. No attempt is made by Mr. Warren to explain anything but the rudiments of account keeping. He does not so much as touch upon the use of the journal and the "impersonal ledger"—he merely names them; nor upon the preparation of a balance-sheet.

Further chapters are devoted to the nature, methods, and law of banking; the customs and law in regard to the transit of goods (*a*) by land and (*b*) by water, the information given in regard to (*b*) being particularly full and valuable; insurance (also dealt with at some length); tariffs; custom and excise; patents and trade-marks; commercial travellers; and chambers of commerce. Some space is also given to employers' liability; but the author here is not quite so well informed as on other subjects. He appears to have an entirely inaccurate notion of the motives prompting employers and employed to adopt mutual schemes under the Workmen's Compensation Act of 1897. He thinks they are adopted in cases where "the employed repose little or no faith in the liberality of their employers, and the latter next to none in the moderation of the claims of their workmen, without specified agreements legally binding on either side." What agreement could be more legally binding on employer and employed than the Act of 1897; and, seeing that the Act provides for a minimum and maximum of compensation payable or claimable, aud that no scheme would provide more at the expense of the employer except by the voluntary exercise of his liberality, what does Mr. Warren mean? These criticisms, however, but slightly qualify our appreciation of this well-written, lucid, little book, which cannot fail to be of great use at all institutions for the teaching of commercial knowledge.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1681.)

THE week before Christmas on the Stock Exchange, without being exactly festive, was yet cheerful to a degree when compared with some weeks not far back in the past; and it formed an agreeable preparation for the enforced idle period when people have time to think about things. South Africa set the dominant note; and markets took their tone from it. It was generally felt that solid substantial progress was being made in the pacification of that afflicted land, and that the arts and crafts of peace were reviving, and promised soon to replace war. So the Funds brightened perceptibly, and other departments were contagiously affected. Business, of course, was not in overflow; and towards the close transactions died away to small proportions. The Money Market was firm, supported by a fairly liberal demand, which is pretty sure to become much stronger before the year closes. Business in Gas stocks was, on the whole, decidedly quiet; and it would have been reduced to very slender proportions indeed, but for a sudden revival of interest in Gaslight ordinary. The market, as a whole, has been suffering, and indeed suffers still, from a calm that has come over it. It is difficult to understand why buying, and cessation from buying, should come in arbitrary waves; but they do. Just now people are not buying much. One would have expected precisely the reverse; for the companies are doing well. Coal and commodities are far cheaper than they were a year ago, residual products have kept up their prices beyond anticipation, and we have been having weather calculated to stimulate the sale of gas. But still, "Gas" in the share market is dull. Gaslight ordinary, however, had a good rally from its late dejection, and was pretty active some days. The secured issues were quiet and unchanged. Little was done in South Metropolitan; but the price was steady. Nothing at all was marked in Commercials; but the old stock was put down by way of encouraging sellers. In the Suburban and Provincial group, the feature was a big drop in Brighton original; but no business was marked at these figures. In the local market, Sheffield "B" and "C" recovered a point. Among the Continental Companies, there was very little doing; and prices were not remarkable. None of the undertakings in the remoter world presented any feature calling for notice. Business in the Water Companies was as sober as usual. Movements were few and slight—being two in number, of which one was up and the other down.

The daily operations may be briefly summed up in the daily variations: On Monday, Brighton original fell 7, and on Tuesday it went down 3 more; but Gaslight ordinary rose 1. On Thursday, Gaslight ordinary rose 1 more; but Commercial old fell 3. In Water, Southwark receded 2. On Friday, Commercial dropped 3. In Water, Lambeth 7½ per cents rose 1.

The Supply of "Solar" Oil for Gas Making.—Referring to a question asked in the "JOURNAL" some time ago, as to whether "Solar" distillate for gas making could be supplied at 50s. per ton, a correspondent informs us that a Company is about to be registered, with a capital of £1,000,000 sterling, for the supply of this oil and liquid fuel. He says that arrangements have been made in Texas which will allow of the supply, during the first half of next year, of "Solar" distillate at the price of 2⅛d. per gallon f.o.b. tank steamer at the different ports of discharge in the United Kingdom. He adds that possibly this figure might be somewhat reduced for contracts extending over a period of years.

OBITUARY.

The death is announced of Mr. T. CLARKE, Secretary of the Wath-upon-Dearne Gas Company, and Chairman of the Swinton and Mexborough Gas Company.

We regret to notice an announcement, in last Saturday's "Times," of the death, on the previous day, of LOUISA, wife of Mr. H. E. Jones, Engineer and General Manager of the Commercial Gas Company. The announcement will have been received with great sorrow by the official staff of the Company to whom Mrs. Jones was personally known, and among whom the knowledge of her critical condition had caused heart-felt grief. Throughout the gas profession, very deep sympathy will be felt for Mr. Jones in his bereavement, and with that sympathy we sincerely unite ourselves.

The death took place, on Thursday night, at his residence at Jarrow, of Mr. WILLIAM SHAW WHYTE, the Manager of the Jarrow station of the South Shields Gas Company, who succumbed to an injury received about five o'clock on Tuesday afternoon. Deceased was superintending the erection of a crane on the Company's quay, when the jib gave way and fell upon his shoulder. He was knocked to the ground, and after being removed to his home it was found that he had sustained serious internal injury. The deceased Manager, who was 54 years of age, had resided in the town for many years, and was much respected by the officials and employees at the gas-works, as well as by a large circle of acquaintances. He was a widower, and leaves a grown-up family.

PERSONAL.

Mr. MARTIN has been appointed Secretary of the Northallerton Gas Company in succession to Mr. J. A. Squince, who has resigned.

Mr. E. P. BROOK has been appointed Outdoor Superintendent to the Halifax Water Department, in succession to Mr. King, deceased.

We learn that Mr. T. ACLAND, the Secretary and Manager of the Brynmawr and Blaina Gas Company, is relinquishing this position to take a similar one with the Llanelly Gas Company. In recognition of his services, extending over a period of ten years, he has been placed upon the Board. His son, Mr. S. J. ACLAND, the Manager of the Ballymena and Harryville Gas Company, will succeed him at Blaina.

Out of the eight candidates forming the short list for the appointment of Gas Engineer to the Oldham Corporation, in succession to the late Mr. John Chadwick, the Gas Committee have selected Mr. TIM DUXBURY, of Middleton. The new Manager at Oldham was Chief Assistant to Mr. Isaac Carr at Widnes till July, 1890, when he was chosen to fill the position at Middleton rendered vacant by the death of Mr. C. L. Hartley. At that time, the make of gas was about 74½ million cubic feet per annum; it is now about 123 millions. At Oldham he will have to produce more than ten times this quantity. Mr. Duxbury joined the Manchester District Institution shortly after obtaining the appointment which he is now relinquishing, and was elected a member of the Committee at the annual meeting last year.

After services extending over 34 years, Mr. THOMAS SIMPSON, brother of the late Mr. Peter Simpson, of Rugby, has resigned the position of Secretary and Manager of the Daventry Gas Company, and has been succeeded by his son, Mr. HENRY DUNHAM SIMPSON, who for the past seven years has been assisting his father. Mr. T. Simpson has been elected a Director of the Company, in place of the late Mr. L. G. Bunting, the Chairman. The undertaking has made steady progress since Mr. Simpson first became connected with it. At the close of the year 1866, the balance on the profit and loss account was £169, which was increased to £183 twelve months later; the gas and meter rental having gone up from £683 to £775. At the end of 1900, the gas-rental alone amounted to £1450; and the balance was £716. Meanwhile, the price of gas had been gradually reduced from 6s. 3d. to 3s. 11d. per 1000 cubic feet, and meter-rents had been abolished. These results indicate good management, especially in view of the fact that the population of the town is slightly decreasing. It bespeaks a continuance of the Company's prosperity that the Directors have been able to secure the assistance of one who has had so large a share in securing it.

A Bit of Old Pimlico in the Market.—We learn that in the course of next February there will be offered for sale, at the Mart, Tokenhouse Yard, the Pimlico station of the Gaslight and Coke Company. The property, the greater portion of which is freehold, comprises the gas-works, offices, workmen's dwellings, &c., and covers an area of 4 acres, with a wharf frontage of 320 feet to the Thames and a tunnel under the Grosvenor Road. The buildings stand between Besborough Place and Pulford Street, on the north-eastern side of St. George's Square. The gas-works were originally established there about 75 years ago on the two banks of the Tyburn, near Vauxhall Bridge. The "Builder," in noticing the matter in their current issue, says that in an excellent map surveyed and drawn by W. B. Clarke, the Architect, and published in 1836, the "gas-works" and "gas factory" are plotted as lying on the northern and southern banks respectively of the Tyburn stream, just above its outfall into the river at Thames Bank Wharf, in (old) Millbank, since renamed Grosvenor Road.

NOTES.

International Testing of Cement.

The third Congress of the International Association for Testing Materials has been held at Buda Pesth. At this Congress, a number of papers were read in regard to cement and cement testing. An abstract of some of these communications has been published in the "Builder," from which the following particulars have been gathered. It is shown that the production and exportation of German and Belgian makes of cement, in competition with English cement, have enormously increased during the past year. The importation of foreign cement into London increased during the first nine months of the year by 244 per cent., which is held to signify that it must be either cheaper or better than the native product. Mr. Bertram Blount, of London, proposed for adoption by the Congress a warm-water test to determine the constancy of volume of cement. A bar of neat cement would be exposed to water at 45° C., when the expansion would be measured by the Bauschinger apparatus. A good cement should remain absolutely free from cracks, and expand not more than 2 per cent., attaining constancy in seven days. It seemed to be agreed by the experts of different nationalities present at the Congress that some form of hot-water test will be submitted for discussion at the next Congress, and adopted for heavy work.

Zinc White and White Lead.

A scientific comparison of white lead and zinc white as pigments for use in both decorative and preservative paints has been made by M. Livache, in the "Comptes Rendus." The writer observes that there are two advantages in favour of zinc white—the first being that it is not discoloured by gas or sulphurous fumes; and the second that its use obviates all risk of lead poisoning. The drawback of zinc is reputed to be its inferior colour, and also deficient covering power. It may further be remarked that it is accused of brittleness. M. Livache declares that zinc white is only fairly comparable with white lead when it is properly mixed; the mixing in the two cases being different. He lays down the general rule that in mixing a paint, the weight of the oil should be in inverse proportion to that of the pigment—that is to say, that the proportions by volume of pigment and oil in all paints, of whatever colour, should be the same. In following out this rule, M. Livache finds that it makes the covering power of zinc white quite equal to that of white lead. Moreover, by the addition of a special drier—such as manganese resinate, which is remarkably powerful and dissolves readily in cold linseed oil—a zinc white paint will dry as well and as quickly as a white lead paint; while there will be no discolouration. As regards the question of plumbism, in respect to painters, this is chiefly attributable to the employment of lead primings and first coats, which have to be rubbed down dry. The dust adheres to the men's persons and clothes. Here the pigment is only needed to give an additional body to the coating, and its colour is of little importance. Adhesiveness to the work is a necessary quality of priming; and this property, according to M. Livache, depends on the porosity of the solid matter. In this respect, zinc white is excellent. By reason of the fact that this pigment is much lighter in weight than lead, and in pursuance of the rule already stated, it follows that a properly-mixed zinc white paint contains more oil than a lead paint. This should render it more flexible, and better able to adapt itself to the effects of exposure to heat and cold.

Weighing the Discharge of Coal from Hoppers.

Mr. Charles Ingrey has devised an appliance for recording the weight of coal discharged from overhead hoppers for supplying boiler furnaces, &c., which should supply a felt want. Most arrangements of the kind measure the coal only, not weigh it; but the problem set to himself by Mr. Ingrey was to absolutely weigh the coal, record the weight, add it to the total, and do all this without being touched by hand. The appliance was described and illustrated in the issue of "Engineering" for Sept. 6. Supposing the existence of the overhead hopper, with a gravity discharge in the ordinary way, the escaping coal is received in a container of a partially cylindrical section, which is pivoted in the centre, and has openings at top and bottom. When the upper opening is clearly underneath the hopper, the coal, of course, runs into it. When the container is swung aside on its pivot, the upper opening is shut against the hopper, and the lower one opened to empty the charge into the bucket of a weighing machine placed underneath it. All these fittings are worked by a system of cams mounted on a horizontal rod kept revolving at a stated speed. These cams can be moved into the operative position by a sliding clutch, worked by hand, whenever the discharge of a parcel of coal is desired by the attendant. When this is done, several things immediately happen. The container is emptied into the weigh-bucket, and returned to its place for another charge; and the weigh-bucket is lowered on to knife-edges, where its contents are automatically weighed against a counterbalance, which registers its movement on a dial. It will thus be seen that the whole operation is perfectly automatic; all that is necessary on the part of the stoker being to pull the string when he wants a fresh charge, the weight of which is duly recorded against him. When discontinuous hoppers are in use, the machine itself is made traversing. The arrangement should be useful for automatic coal carbonizing with inclined retorts, as well as with mechanical stokers.

TECHNICAL RECORD.

BLAST-FURNACE GAS-ENGINES.

Not for the first time during the present year have the proceedings of the Institution of Civil Engineers offered matter of unusual interest to those belonging to the gas industry, as was again the case a fortnight ago (the 10th inst.), when a commencement was made with the reading of a paper from the pen of Mr. Bryan Donkin. The subject was one of up-to-date interest—"Motive Power from Blast-Furnace Gases;" and the author is well known to the gas profession for many reasons, not least among which are the thoroughness and care that he always brings to bear upon the scientific investigations and the experiments for which the engineering world is indebted to him. According to the usual custom, the Secretary of the Institution (Dr. J. H. T. Tudsbery) read the paper in the clear and admirable style with which his hearers are familiar.

The author refers, in opening, to the growing importance of this comparatively new source of power. From the fact that in the year 1899 more than 40 million tons of iron were produced by the world's blast-furnaces, it cannot be doubted that the harnessing and utilization of the gases therefrom must, in the future, play an important part. Of course, it has been known for some time past that an effective power gas was produced from blast-furnaces; having been noted by M. Lenchauchez in 1878. As has happened in other inventions, that of gas lighting among the number, the practical application of these gases was attempted, at about the same time, in three different countries—namely, in Belgium, Germany, and England. There were two questions which had to be answered by engineers in endeavouring to utilize this source of hitherto wasted power. Were these gases of any practical value? and, if so, were gas-engines the best motors for converting their heat into power? When the same gases are obtainable for firing boilers to supply steam-engines, and also for driving gas-engines direct, it is known that the latter method offers many advantages. To raise 1-horse power from a boiler fired by gas, about 400 cubic feet are wanted; whereas only 100 cubic feet are required to produce the same power in a gas-motor. This is, of course, with a low-grade gas. If long lines of boilers and steam-engines and chimneys were done away with, and replaced by gas-engines driven by the blast-furnace gases and driving the air-blast cylinders, then a great economy would be the result. If all the gases, for example, from a blast-furnace dealing with (say) 100 tons of iron ore were to be turned to account in the cylinder of a gas-engine, not only would there be sufficient for the blast and for heating the air required, but there would also be an excess of about 2000-horse power.

It was thought that the large amount of nitrogen in these blast-furnace gases would prove to be a difficulty to their use; but the course taken is merely to reduce the proportion of air mixed with them to make the explosion, or to increase the amount of gas. The best proportion of air to lighting gas is about 8 to 1; to producer gas, 1·4 to 1; and to blast-furnace gas, 1 to 1. In some trials, an engine gave 120-horse power with lighting gas, and 100-horse power with high-furnace gas, which may be explained by the small admixture of air and the high compression adopted. Other difficulties have been overcome—such as variations in pressure and in composition; the chief one remaining being that connected with the dust carried along in these gases. This dust is largely metallic, but varies very much in character. The heavier particles can be got rid of by gravitation; while the lighter portion has to be washed. It has always been the general custom to relieve these gases of their dust, even when they were used for boiler firing. In some French iron-works, the gases are made to pass through large vertical pipes, with their bottom ends immersed in water, something after the style of ordinary gas-works condensers. German works sometimes have large dust-purifiers; and, in fact, much of the purifying or cleaning apparatus in use with these blast-furnace gases is similar to that established in coal-gas works. Thus, a common contrivance is a rotary centrifugal washer, driven by a separate motor. In it water, flowing in the opposite direction to the gas, cleanses it, and removes the fine dust, at the same time acting both as condenser and exhauster.

Different works have different methods; all, however, with the same object of both cooling and cleaning the gas. At Seraing, for instance, three pairs of tower scrubbers, filled with coke and sprayed with water, are used. At the Friedenshütte works in Upper Silesia, where there was heavy zinc dust to contend with, sawdust purifiers, in conjunction with scrubbers, eventually proved successful. At Differdingen, the amount of dust was reduced from the high figure of 5 grammes per cubic metre to the low one of $\frac{1}{3}$ gramme, by two fans revolving at about 900 revolutions per minute. The water entered with the gases at the centre. It still appears to be somewhat a moot point whether gas-engines working with thoroughly purified and dust-freed gases will do better and more work than if supplied with only partially cleaned gas.

The successful utilization of blast-furnace gases at once gave an impetus to the building of much larger gas-engines than had hitherto been usual. Whereas five years ago 250-horse power engines were considered the maximum feasible, now many are made, and at work, as large as 1500-horse power. One difficulty with these powerful engines lies in starting them. At Seraing, the cylinder is first filled with air and benzene vapour, and fired electrically; there being also a hand-lever gearing into the fly-wheel. In other cases, compressed air is the means of starting. Yet another difficulty was found in the matter of speed. At first, the engines drove by means of belting; but direct gearing to the air blowers was afterwards tried, and proved to be more economical. Of course, it is well known that, to obtain the maximum economy from a gas-engine, it must work at its maximum load. But having such a large amount of gas—otherwise power—at disposal, the greatest economy of gas consumption need not be too closely considered. Special arrangements have been made in the Seraing installation whereby the pressure of the air is increased when the speed of the gas-engine drops. Thus the blower, which is coupled direct to the engine, answers immediately to the varying requirements of the furnace.

Mr. Bryan Donkin then gives an historical account of the utilization in gas-engines of furnace gases. There are, up to the present, but three or four makes of engine working with them—the Otto, Simplex, Oechelhaeuser, and Körting. It was in May, 1894, that Mr. Thwaite originally applied blast-furnace gases to produce power; while in February, 1895, at the Glasgow Iron and Steel Works at Wishaw, he utilized them to supply the works with electric light by means of an "Acme" engine of the Otto four-cycle type. After this date, though apparently thought out independently, comes the more important installation at Seraing for the Société Cockerill. Several tests have been made there with a 600-horse power gas-engine coupled direct to the blowing cylinder. The Witz bomb gave the heating value of the gases as 111 B.T.U. per cubic foot; and the Junkers calorimeter, which Mr. Donkin believes to be more accurate, as 99 B.T.U. The diameter of the engine cylinder is 4 ft. 3 in., and the stroke 4 ft. 7 in. The through crank shaft is 18 inches diameter; and the fly-wheel weighs 33 tons, having a diameter of 16 ft. 5 in. The weight of the engine is 94 tons, or together with the blower, 158 tons.

Another discussable point is that relating to the advisability of adopting single or multiple cylinder engines. It is claimed for the former that they are simpler; while it is stated that the latter give more economical results in consumption of gas and water. Certain is it that there is a larger reserve of power, and less likelihood of premature explosion, with several cylinders than with only one. Mr. Donkin has studied, in many countries, the details and problems of this new and growing source of power; and in view of its very rapid development on the Continent, he is undoubtedly right in bringing it prominently to the notice of English gas engineers, ironmasters, and others interested, whose thanks will certainly be accorded him.

The reading of Mr. Donkin's paper was concluded on Tuesday evening, the 17th inst., when a short discussion was opened and closed upon it. Some interesting photographic lantern slides were thrown on the screen, illustrating various arrangements of engines and fans. Mr. Horace Allen, backed by thirty years' experience of blast-furnaces, complained of the slowness of iron-masters in realizing the enormous power now at their disposal. He said that the author had omitted to mention the practice of having small gas-engines for the purpose of starting the large ones. This system had proved very effective in some Thwaite installations. One interesting item mentioned by the speaker was the fact that, during the recent storm, the only gas-engine unaffected by it was that driven by blast-furnace gases. Mr. Denny raised the question of getting rid of the moisture in the gases introduced partly by the washing process, as the explosions were injuriously affected thereby. He believed that thorough purification was essential to good working, as otherwise the suspended foreign matter would wear the engine cylinders, and thus cause loss of power. The next speaker was Mr. Andrew Brown, whose accent gave one the information that he hailed from north of the Tweed. He humourously finished his remarks by pointing to a serious error in the author's paper—namely, where he said that the idea of using these gases in the way described arose simultaneously in Belgium, Germany, and England. As the installation at Wishaw had been the first, as mentioned by Mr. Donkin, it seemed just that for "England" should be read "Scotland." He (the speaker) had lately visited the Differdingen (Luxemburg) plant; and had much admired it. The paper was a record of facts, which showed the importance of adopting in this country all the means described to ensure economical working, so that we could successfully compete with others. Another speaker thought that dust purification might be overdone, as some dust, such as that from hematite ore, acted, in part, as a lubricator. It was suggested by another gentleman that we should soon find ourselves, owing to increasing economies in using these gases, in possession of vast power which we did not want, and which we did not know what to do with. He considered that, in time to come, electro-chemical industries, in which units of 10,000-horse power were dealt with, would spring up and be attached to iron-works. Mr. Davey, as a mechanical engineer, said that designers of gas-engines had yet a lot to do. He thought some speeds were excessive, and wished to see long strokes and few revolutions. He called to mind Sir Frederick Bramwell's prophesy as to the eventual replacing of steam by gas engines, and the relegation of the former to museums. Later on, Sir Frederick himself spoke. He said there was constantly a demand for more and more rapidity, and direct-driven plant. For what purpose did we require slow work, except pumping? Why should gas-engines go slower? For his part, he wished them to go quicker, and so get more work done. Mr. W. W. Beaumont made some remarks on

valves; and supported the practice of high speeds, as the higher the compression was, the higher the efficiency became. Mr. Bryan Donkin then briefly replied to the discussion; and the proceedings terminated.

We now only wish (in conclusion) to add, on our own part, our appreciation of the author's services in thus summarizing the history so far of the utilization in gas-engines of blast-furnace gases, and to emphasize the great importance of the subject, not only as regards the gas and iron industries, but also as affecting the welfare of the country at large.

EXPLOSIVE GAS MIXTURES.

By Dr. H. BUNTE, of Carlsruhe.

Abstract Translation of a Paper read before the German Association of Gas and Water Engineers.

Explosive gaseous mixtures are interesting from two different aspects, according as they produce useful or disastrous results. A mixture of gas and air, exploded in the gas-engine, is a motive power; while, on the other hand, the explosive gaseous mixtures which occur in coal mines, where they are known as fire-damp, are dangerous in the highest degree, as are also mixtures formed from coal gas and other combustible gases. Our knowledge of the behaviour of such explosive mixtures is mainly derived from the researches on fire-damp, with which the most renowned chemists have battled for upwards of a century. Davy, in 1815, published an account of his investigations which culminated in the invention of the safety lamp, which has since proved of such immense service to the mining industry. Bunsen published in 1858, the first impression of his work on methods of gas analysis, and thereby helped greatly to extend our knowledge of the nature of explosive gaseous mixtures. In 1883, Mallard and Le Chatelier dealt exhaustively with the combustion of such mixtures, and all later work on the subject stands in close relation to theirs. These dates mark the more important epochs in the history of the subject, which, however, has been treated by many other investigators. Nevertheless, there are many gaps in our knowledge of it; and it was with a view to filling some of them that the author undertook some new researches, with the assistance of Drs. Eitner and Trautwein. The data here recorded are based on the result of the researches.

A gas explosion is the result of a sudden combustion of a mixture of air and a combustible gas—such as, in particular, illuminating gas. The development of heat which results from the combustion expands the products of combustion; and they exert a pressure or shock on the encompassing walls, more or less severe according to the composition of the mixture and the nature of the gas. This pressure is applied in the gas-engine in performing useful work; while it is also responsible for the destructive effects of unpremeditated gas explosions.

It is unnecessary to remind gas engineers that coal gas is not itself explosive, though the general public is convinced that a gasholder entails danger of explosion to the locality where it is. Clegg's demonstration, in a London gas-works, nearly a century ago, before a Commission, of the inexplosiveness of coal gas, by knocking a hole in the side of a gasholder, and igniting the outflowing gas, might even now bring conviction when the question of danger of explosion from gasholders is under discussion in connection with the granting of concessions for gas supplies. It has also been proved, through the action of a criminal at Glasgow, that the contents of a gasholder are not exploded by the most powerful blasting agents; for dynamite there destroyed only ironwork, and the escaping gas ignited and burnt away. A similar experience has recently been reported from Cork. The fact that the escaping gas becomes ignited, is in itself a safeguard, as thus the mingling of unburnt gas with air, which would produce a large volume of an explosive mixture, is prevented.

A particular temperature is needed to initiate the combustion of a mixture of air and combustible gas. Speaking broadly, this temperature of ignition differs with the nature of the gaseous mixture, and is also affected by widely varying conditions. If a combustible mixture of gas and air in a tube is heated slowly from the exterior to a high temperature, a silent or slow combustion occurs, without visible flame and without explosion. If, however, the mixture is rapidly raised to a sufficiently high temperature, a sudden combustion throughout the whole mass of gas, and an explosion, can happen. But it is not every mixture of air and a combustible gas which is explosive. The questions to be considered therefore are: At what temperature does ignition take place? and, In what proportions must the gas and air be mixed in order to detonate?

The temperature of ignition, as already stated, is dependent on different influences. According to Mallard and Le Chatelier, hydrogen ignites at 555° C., carbonic oxide at 655° C., and marsh gas at 650° C. Admixture of indifferent gases raises the temperature of ignition only slightly. On the other hand, many porous bodies—notably platinum sponge—have the power of so accelerating combustion, which is started slowly at a low temperature, that ignition and rapid explosive combustion result. The action of automatic gas-lighters depends upon this phenomenon.

With regard to the second question, the proportions in which combustible gases and air must be present in order to constitute an explosive mixture are shown in Table I., and graphically in Diagram I.

TABLE I.—*Results of Explosion Investigations with Mixtures of Gas and Air (in a Tube ¾-Inch in Diameter).*

Description of Gas.	Percentage of the Combustible Gas in the Mixture.		
	No Explosion.	Explosion Range.	No Explosion.
Carbonic oxide	16·4	16·6—74·8	75·1
Hydrogen	9·4	9 5—66·3	66·5
Water gas	12·3	12·5—66·6	66·9
Acetylene	3·2	3·5—52·2	52·4
Coal gas	7·8	8·0—19·0	19·2
Ethylene	4·0	4·2—14·5	14·7
Alcohol	3·9	4·0—13·6	13·7
Marsh gas	6·0	6·2—12·7	12·9
Ether	2·6	2·9— 7·5	7·9
Benzene	2·6	2·7— 6·3	6·7
Pentane	2·3	2 5— 4·8	5·0
Benzoline	2·3	2·5— 4·8	5·0

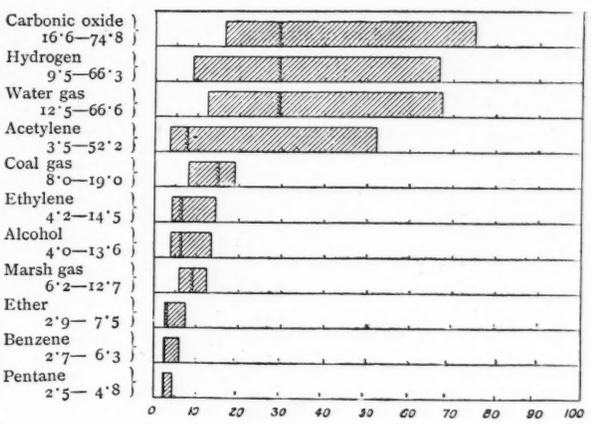


DIAGRAM I.

It is clear that all mixtures of combustible gas and air are not explosive, but only those in which ignition by an electric spark or a flame spreads from one spot throughout the whole mass of gas. This will only occur if the combustion of the quantity of gas first ignited gives rise to such a temperature that the adjacent layers of gas will be thereby ignited, and will in like manner transmit ignition to the whole mass of gas. If there is a great excess of air present, the temperature of combustion, which results at the point of ignition, will remain below the temperature of ignition; and the combustion will not extend. The same thing will occur with the deficiency of air or oxygen—that is, with a great excess of the combustible gas—when the combustion cannot be complete. Thus there are two limits for the proportions of mixture of a combustible gas and air, between which its range of explosion lies. The lower limit is with excess of air and deficiency of combustible gas; the upper limit, with deficiency of air and excess of combustible gas.

These limits differ with the nature of the combustible gas; but they also shift with varying conditions—as, for instance, with the size of the containing vessel, the method of ignition, &c. In order to obtain comparable values for different gases, the experimental conditions must be kept quite uniform, as was the case in the researches here recorded. These have been conducted in a gas burette 19 mm. (¾ inch) wide, and therefore refer to a pipe of that diameter; and ignition of the gas, which stood over water, and was therefore saturated with aqueous vapour, was performed by a powerful electric spark. From the above experimental results, the limits of explosion tabulated in Table II. were calculated.

TABLE II.—*Limits of Explosion in a ¾-Inch Tube.*

Description of Gas.	Lower Limit.	Upper Limit.	Explosion Range.
Carbonic oxide	16·50	74·95	58·4
Hydrogen	9·45	66·40	57·4
Water gas	12·40	66·75	54·3
Acetylene	3·35	52·30	49·0
Coal gas	7·90	19·10	11·2
Ethylene	4·10	14·60	10·5
Alcohol	3·95	13·65	9·7
Methane	6·10	12·80	6·7
Ether	2·75	7·70	5·0
Benzene	2·65	6·50	3·9
Pentane	2·40	4·90	2·5
Benzoline	2·40	4·90	2·5

This table includes twelve gases and vapours, of which two—viz., coal gas and water gas—are mixtures. It shows their behaviour in admixture with air. The several gases are tabulated in order, according to the extent of their range of explosion, which varies greatly with their chemical nature. If the experimental conditions are always precisely similar, the limits of explosion can be established with great precision. For instance, under certain fixed conditions, a mixture of carbonic oxide and air,

containing 16·6 per cent. of the carbonic oxide, detonates throughout its whole mass; while one containing 16·4 per cent. does not detonate. Therefore 0·2 per cent. more or less of the combustible gas suffices to convert an incombustible mixture to an explosive one, or *vice versâ*. The range over which the mixture of gas and air is explosive extends with carbonic oxide from 74·95 to 16·5 = 58·45 per cent. of all possible proportions. Hydrogen behaves very similarly; but explosiveness commences with a more dilute mixture (9·45 per cent.), and ends earlier (66·4 per cent.). The explosion range extends over 57 per cent. of all possible mixtures. Water gas is a mixture of carbonic oxide and hydrogen; and its properties lie between theirs. Acetylene concludes the first group of gases, which have a wide explosion range, and therefore form mixtures with air which are specially dangerous.

The second group starts with coal gas, of which the explosion limits naturally vary slightly with variations in its composition—as, for instance, according to the percentages of hydrogen and marsh gas present. Its range of explosion corresponds fairly well with that of ethylene and of alcohol; while the range with marsh gas, which forms the chief component of fire damp, is still more restricted. With the vapours of ether, benzene, and pentane, detonation occurs with less than 3 per cent., but ceases with 7·7 per cent. in the case of ether, and with less in the case of the other bodies.

On seeking the reason for this different behaviour of the various gases, we find it is partially due to their chemical nature, but mainly to the amount of oxygen which is required for combustion. Great heat of combustion and ease of ignition extend the limit of explosion downwards; while the great supply of oxygen required by the denser vapours shifts back the upper explosion limit, and restricts the range within which explosion occurs. The quantity of oxygen required for complete combustion differs greatly with the different gases, and is as follows:—

Description of Gases.	Volumes of Oxygen Required to Consume one Volume of Gas.
Carbonic oxide, hydrogen, or water gas	0·5
Marsh gas	2·0
Acetylene	2·5
Ethylene or alcohol vapour	3·0
Ether	6·0
Benzene	7·5
Pentane or benzoline	8·0
Coal gas	(about) 1·2

Mixtures of combustible gases with the exact quantity of oxygen required for complete combustion are known as "detonating gas." For example: One volume of carbonic oxide with half-a-volume of oxygen is "carbonic oxide detonating gas." If there is hydrogen in place of the carbonic oxide, the mixture is "hydrogen detonating gas." If the admixture of the combustible gas is with air, the air required is about five times the volume of oxygen; and such mixtures are known as "carbonic oxide air detonating gas." &c. The ratio of combustible gas to air which corresponds to such an atmospheric detonating gas is given in Table III., and is shown on Diagram I., by the space marked by shading inside the area which represents the explosion range. This ratio nearly agrees with the mixture of air and combustible gas with which the explosion exerts the most powerful action, as the smallest quantity of diluents, which do not participate in the combustion, is present, and consequently the highest temperature of combustion is attained.

TABLE III.

Description of Gases.	100 Volumes of Detonating Gas contain—		100 Volumes of the Explosive Mixture contain Theoretical Detonating Gas—	
	Combustible Gas.	Air.	At the Lower Limit.	At the Upper Limit.
	Vols.	Vols.	Vols.	Vols.
Carbonic oxide	29·6	70·4	24·75	15·78
Hydrogen	29·6	70·4	14·17	21·16
Water gas	29·6	70·4	18·80	20·94
Acetylene	7·7	92·3	11·72	14·03
Coal gas	14·9	85·1	17·40	31·15
Ethylene	6·5	93·5	16·40	23·91
Alcohol	6·5	93·5	15·00	24·17
Marsh gas	9·5	90·5	18·30	27·47
Ether	3·4	96·6	19·25	22·61
Benzene	2·7	97·3	19·87	22·25
Pentane	2·6	97·4	21·60	22·47

The proportion in which detonating gas is found in the mixture of a combustible gas and air at the lower explosion limit—that is to say, what quantity of gas enters into combustion when explosion occurs at the maximum dilution of the gas—is shown for each gas in Table III. and Diagram II. The shaded part gives the quantities of gas entering into combustion, the left-hand shading showing the combustible gas, and the right-hand the air required for its combustion. The adjacent clear space up to the cross line shows the volume of oxygen in excess, and the remaining space corresponds to the amount of atmospheric nitrogen in the mixture. The oxygen in excess and the nitrogen do not participate in the combustion. On comparing the ratios for the several gases, it will be seen that the quantities of "detonating gas" required to initiate an explosion show much smaller differences than were observed in the limits and ranges of explosion. For instance, a mixture of benzene or pentane with air, at the lower explosion limit, contains a greater volume of detonating gas

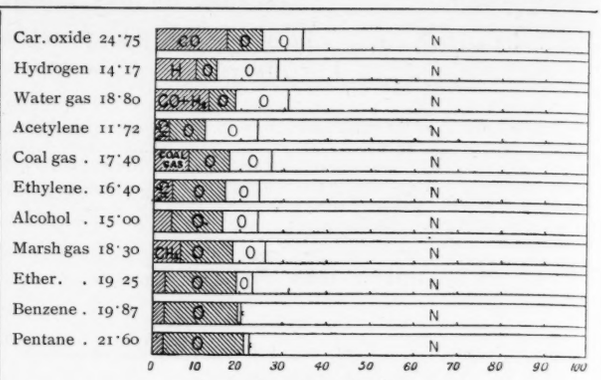


DIAGRAM II.

than is present with hydrogen. Acetylene, being an endothermic gas, of course, forms an exception to these generalizations.

The limits of explosion here given are, as has already been pointed out, only comparative values for the behaviour of the gases under like experimental conditions. They are by no means fixed and immoveable, but are modified by very many circumstances—being sometimes shifted, and sometimes extended. The width of the enclosing vessel, the quantity of the gaseous mixture, and the method of ignition all have a very marked influence. For instance, while the explosion limits for hydrogen, in a ¾-inch tube and ignited by an electric spark, are 9·45 and 66·4 per cent.; in a bulb 4¾ inches in diameter and containing about 1 litre, they become extended to 8·7 and 75·5 per cent., or by more than 10 per cent., if ignited in the same manner; while ignition by a gas-flame causes explosion when the mixture contains only 8·5 per cent. of hydrogen. Another condition which exercises much influence is whether the mixture is ignited from the bottom of the tube or the top. Under similar conditions in other respects, ignition occurs with hydrogen with only 4·5 per cent. of that gas, if it is ignited from below; but 8·5 per cent. is necessary when it is ignited from above. Other gases behave similarly.

The pressure and temperature of the mixture also affect the general circumstances under which combustion is started, though, apparently, not to an equal extent with all gases. For instance, Eitner and Bucerius found no alteration of the limits of explosion with the mixture of hydrogen and air with pressures ranging from 0·5 to 4 atmospheres, though the high pressures facilitated explosion, or provoked it in a more dilute mixture, when carbonic oxide took the place of hydrogen. High temperature gives very similar effects. Gradual heating to 570° Fahr. was found by Roscowski to cause only a slight shifting of the explosion limits. Recently, however, Le Chatelier and Boudouard have shown that very much diluted mixtures of carbonic oxide and air can be made to explode by previous rapid heating to a high temperature. While at ordinary temperatures 16 per cent. of carbonic oxide marks the limit of explosibility, 14·2 per cent. suffices at 750° Fahr., 9·3 per cent. at 915° Fahr., and 7·4 per cent. at 1110° Fahr. for explosion. These observations are of great significance in the application of gases containing carbonic oxide—such as blast-furnace gas and producer gas—in gas-engines.

The tables given may therefore be used for comparing the behaviour of the different gases, which is the object for which they have been drawn up; but it must be clearly understood, in applying them to practical purposes, that many circumstances can cause a considerable extension of the limits of explosion, and that therefore there is danger of the possibility of starting an explosion even when the composition of the mixture differs pretty widely from the conditions specified in the tables.

Further, in laboratory researches, mixtures thoroughly uniform in composition only are dealt with; while the mixtures of combustible gases with air which are found on the practical scale seldom are so. Therefore, there may be at one spot a mixture of a sufficient degree of dilution to avoid explosion, while at another spot all the conditions which make it possible to start an explosion may exist. This is in particular the case when mixtures, such as one of coal gas and air, occur, and no means must be neglected to prevent the occurrence of such mixtures, or to avoid all chance of their ignition.

(To be continued.)

A comparison of the number of completed English patents for coal-tar products taken between 1886 and 1900 by the six largest English and six largest German firms shows 86 for the former and 948 for the latter.

The original rock pressure of the natural gas in the Indiana field in 1886 was 325 lbs. to the square inch. At the close of 1900, it averaged 110 lbs.—a pressure which represents only 34 per cent. of the total original amount sealed up in the rock.

It was officially announced last Wednesday that the number of Bills deposited in the office of the Clerk of the Parliaments, House of Lords, for the ensuing session, up to Tuesday night (the latest time for making such deposits), was 220, as compared with 235 lodged at the corresponding time last year for the session of 1901.

PRODUCTION OF FERROCYANIDE FROM GAS LIQUOR.

The following is the substance of a communication by Professor E. Donath, of Brünn, to a recent number of the "Journal für Gasbeleuchtung."

More complete recovery of the cyanogen in coal gas than has generally been practised must be effected by what is known as the wet cyanide extraction process. This does away also with the disadvantage which the presence of cyanogen in gas has for the gas liquor and oxide purification. But the old method, in which the greater part of the cyanide compounds are extracted at the same time as the sulphuretted hydrogen in the purifiers, will continue for some time to be important; and the spent oxide will remain a most valuable source of ferrocyanides. The quantities of cyanides in gas liquor are very small; but, nevertheless, their recovery has long been attempted. In 1882, H. Bower took out a patent by which he converted the cyanides in liquor into ferrocyanides, by adding iron before distilling the liquor with lime. Lunge refers disparagingly to this process in his work on "Coal Tar and Ammonia" (Third English edition, p. 861). Nevertheless, the idea has been followed up; for an English patent, dated Jan. 6, 1896, was granted to H. Bower, for a process for obtaining a double cyanide by the addition of iron or iron salt to gas liquor.* These circumstances have prompted the author to make known some observations which he made in an ammonia works.

Gas liquor is well known to be corrosive towards iron; and when hot it acts on iron in a very energetic manner. Thus the pumps engaged in transferring cold liquor scarcely show any corrosion; but the iron parts of the distilling plant frequently are considerably corroded. Thus one portion of a Feldmann's distilling plant was found to have become friable throughout its mass, so that a knife could be driven through the tolerably thick sides in many places. Scrapings from it consisted chiefly of graphite and prussian blue. The latter must have been produced through the agency of the sulphide in the gas liquor, in the same way as it is produced in fouled oxide. The iron must first have been converted into ferrous sulphide, and then the latter into prussian blue.

At the same works, sal-ammoniac was made by directly saturating gas liquor with crude hydrochloric acid. The crude acid contains arsenic and iron; and in order to precipitate the arsenic, the acid was, in the first place, treated with a certain quantity of the yellow mother liquor left when ammonium carbonate has crystallized out from the so-called "concentrated" gas liquor at a rather low temperature. This mother liquor contains the more readily soluble compounds—such as the sulphide and cyanide or ferrocyanide of ammonia. Of course, there is considerable development of heat, and sulphuretted hydrogen is evolved, when the mother liquor is added to the crude acid. At the same time a not inconsiderable quantity of dark greenish sludge separates out. This was examined. When dried, it became a greenish black powder, with a tarry odour, and was found to consist chiefly of prussian blue, and to contain arsenic sulphide and tarry and pitch-like substances.

After various trials, a simple method of obtaining the prussian blue in a pure state from this sludge was discovered. The dried sludge was digested with a certain quantity of concentrated crude hydrochloric acid, which dissolved only the prussian blue, and left the arsenic sulphide and tarry substances undissolved. The solution obtained on filtering through a lamb's wool sack was merely diluted with water, whereupon the prussian blue was completely recovered as such.

This observation will not have any great technical importance. Where, however, sal-ammoniac is produced in the manner described direct from concentrated gas liquor, the cyanogen compounds contained in the gas liquor could be recovered without much difficulty from the aforesaid yellow mother liquor, in which they are collected. The concentrated hydrochloric acid used for the extraction of the prussian blue from the sludge could be again applied, even in the diluted state to which it is brought, for the production of sal-ammoniac.

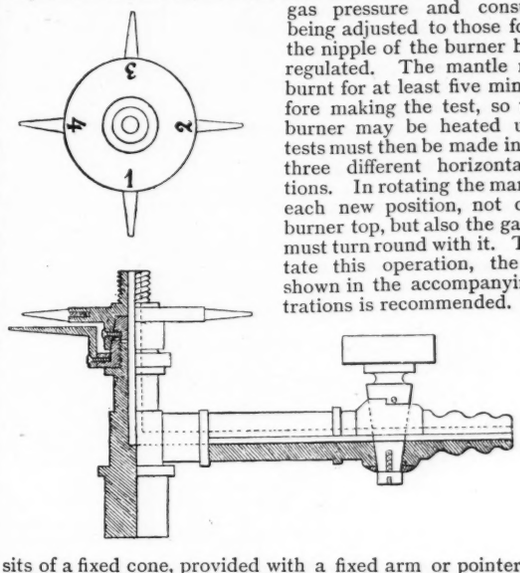
PHOTOMETRY OF INCANDESCENT MANTLES.

A recent number of the "Journal für Gasbeleuchtung" contained a report on the above subject presented to the German Association of Gas and Water Engineers, by the Photometry Committee, at the meeting of the Association in Vienna last June. An abstract of the report, prepared by Mr. H. Ballantyne, appears in the current issue of the "Journal of the Society of Chemical Industry," from which the following particulars are taken.

Testing Burner.—As burners of different forms may give different results with the same mantle, the testing burners must always be of the same construction. They are first tested without mantles, to see that they burn uniformly and that the greenish-blue zones are of the standard form, and before each test they are blown through to clean them. The mantle supports must be so high that the distance between the burner rim and the upper edge of the mantle is at least 70 mm. (2·8 inches). The glass chimney should be a smooth unperforated cylinder, 25 cm. (10 inches) long.

Regulating the Gas-Nipple.—The gas-nipple of the burner should be so regulated that, with a gas pressure of 35 to 40 mm. (1·4 to 1·6 inches), the consumption will be 115 to 130 litres (4 to 4·6 cubic feet) of gas per hour. Before regulating the nipple, the mantle is maintained at incandescence for at least half-an-hour on a burner with a consumption of about 130 litres per hour. The nipple is then adjusted by gradually increasing the apertures until, at a uniform pressure of between 35 and 40 mm., the highest illuminating power is reached. To check this point, the gas pressure should be reduced by about 5 mm., by means of the micrometer screw of the gas-meter, when a diminution in luminosity should be perceived. The proper pressure is then restored.

Testing the Mantles.—To determine the illuminating power of any make of mantle, at least four mantles must be tested; the gas pressure and consumption being adjusted to those for which the nipple of the burner has been regulated. The mantle must be burnt for at least five minutes before making the test, so that the burner may be heated up; and tests must then be made in at least three different horizontal directions. In rotating the mantle into each new position, not only the burner top, but also the gas-nipple must turn round with it. To facilitate this operation, the device shown in the accompanying illustrations is recommended. It consists of a fixed cone, provided with a fixed arm or pointer, and a rotable upper part, which is numbered and carries four pointers. Its method of application is obvious.



Standard of Light.—Experienced observers can obtain satisfactory results with the standard Hefner flame; but beginners find great difficulty, owing to the marked difference in the colour of the two lights. Moreover, with mantles of 70 to 100 candle power, the photometer screen comes so close to the Hefner standard, that very slight movements of the screen produce large differences in the reading. The use of an intermediate light standard is therefore recommended, consisting of either a small electric incandescent lamp, actuated by accumulators, or a "Liliput" incandescent gas-lamp, provided with a pressure-regulator. The "Liliput" lamp must have burned for at least 50 hours before it is used for photometric purposes. The value of the intermediate light standard is determined at the beginning and end of the test by means of a Hefner lamp; the results being calculated to Hefner units.

Durability Tests.—It is sufficient to determine the illuminating power of the mantles at the outset, and after 24, 100, and 300 hours' burning respectively—a clean chimney being used during each photometric test. The gas must burn throughout at the rate and pressure prescribed above—the pressure of 35 to 40 mm. being particularly attended to; and with this object the burner-stand should be provided with an efficient governor.

Possible New Petroleum Field near Naples.—In the current number of "Nature," Mr. R. T. Günther states that when sailing from Posilipo to Sorrento on the 31st of August last, at about four or five miles from the nearest land of the Sorrentine Peninsula, he encountered a most unmistakable smell of petroleum, just as if a leaking petroleum tank steamer had crossed the ship's bows a few moments previously. Two tracks of the smell were distinctly noticeable—the one at lat. 40° 41′ 30″, long. 14° 19′, and the other at lat. 40° 42′, long. 14° 18′ 30″. A moderate *furano*, or southerly wind, was blowing at the time, so that in all probability the source of the petroleum was, he says, somewhat to the south of the position given. The only other record of a petroleum source in the immediate vicinity of Naples is that of the Balneum Olii Petrolei, or *bagno del petroleo*. Mr. Günther expresses the opinion that the depth of the water (80 fathoms) at the part of the Bay of Naples where the smell was noticed is too great for the collection of the petroleum to be commercially practicable. But the long-continued escape of petroleum in the immediate vicinity of the Apennine Limestones of the Sorrentine Peninsula is, he thinks, an indication that deep borings might be successful and might one day yield as profitable a supply of petroleum as the borings in Northern Italy.

* See "JOURNAL," Vol. LXIX., p. 78.

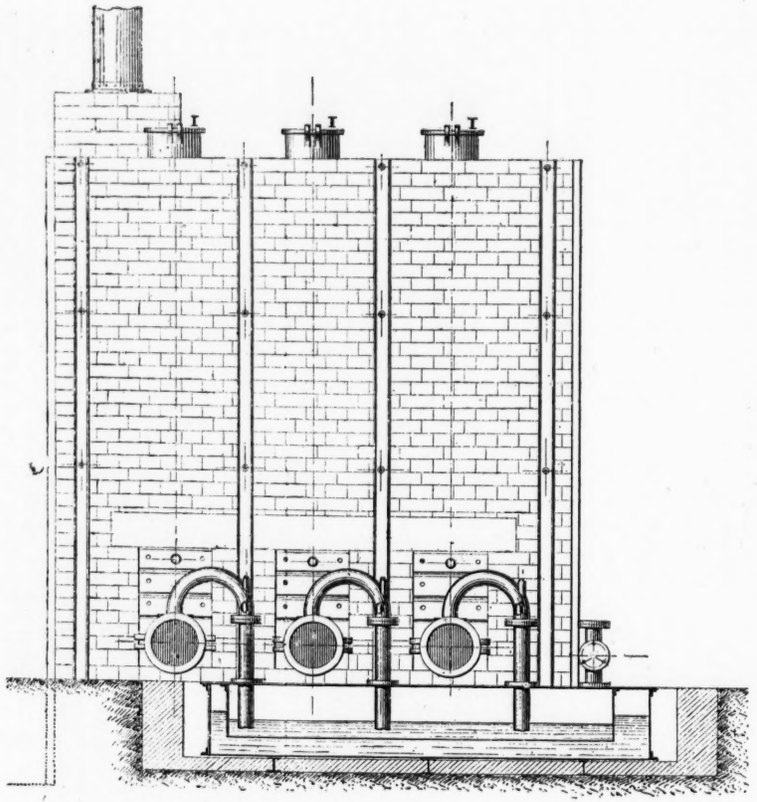


FIG. 1.—RICHE GENERATOR: SIDE ELEVATION.

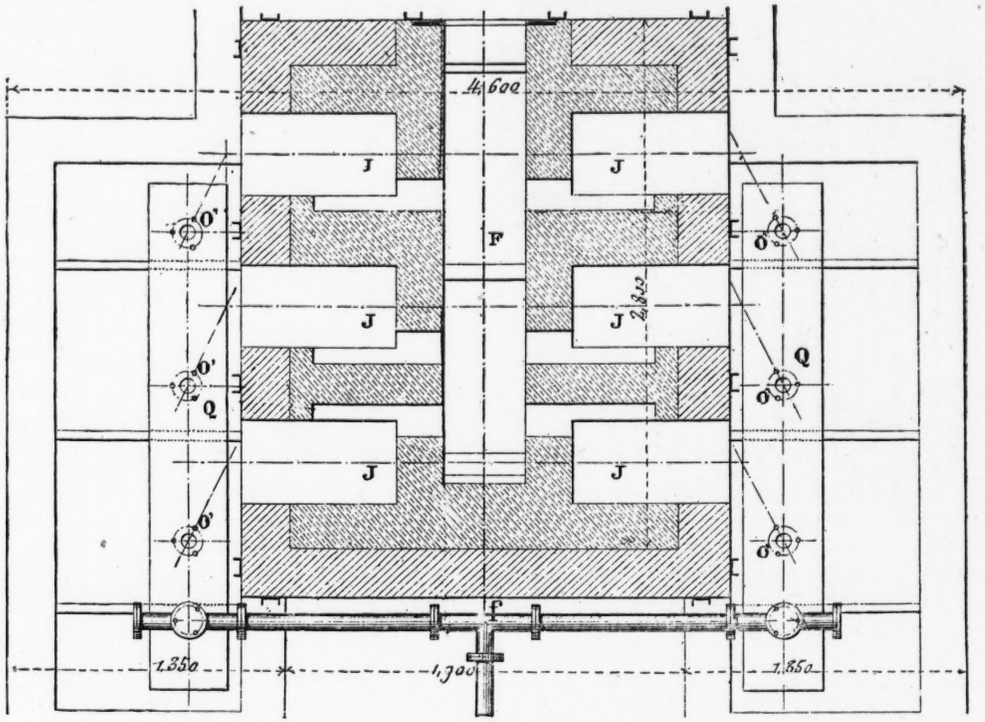


FIG. 2.—PLAN OF GENERATOR ON THE LINE *c d* OF FIG. 4.

THE RICHÉ WOOD GAS PROCESS.

In previous issues of the "JOURNAL," references have been made to the process devised by M. Riché, of Paris, for making gas from wood. There is, of course, nothing new in the manufacture of gas from wood, it having been employed, with more or less success—as shown in the chapter on "The Production of Illuminating Gas from Materials other than Coal," in the third volume of "King's Treatise on Coal Gas"—from the earliest days of gas lighting. The product of the operation, has, however, been an impure gas of low calorific power, and expensive to make. These drawbacks have been greatly minimized during the past few years by the above-named gentleman, whose process and plant were described in a recent number of the "Iron and Coal Trades Review." The following particulars are taken from our contemporary; and for the loan of the blocks accompanying them we are indebted to the courtesy of the proprietors.

In the destructive distillation of wood so far, no matter what kind of apparatus was employed, the following three kinds of products have been obtained: (1) The permanent gases, consisting of carbon monoxide, carbon dioxide, and the hydrocarbons, with a small quantity of nitrogen. (2) Vapours, which, on being condensed, gave three layers of liquid bye-products—the top one consisting of the light tarry oils with benzol, toluene, and a small quantity of phenol and creositic resins, with varying amounts of acetic acid; the intermediate layer consisting of a water in which was found various fatty liquids and acids, also wood spirit and tarry compounds; and the bottom layer composed of heavy oils and tars charged with acetic acid and a small quantity of phenol and creositic compounds. (3) A charcoal residue, the amount of which depended on the manner in which the operation had been conducted.

It is a well-known fact that if the distillation of wood was carried on at a high temperature, the volume of permanent gas obtained increased in ratio to the temperature at which the distillation proceeded in the retort; and this was due to the reactions which occurred between the volatile compounds of wood and the heated charcoal present in the retort—red-hot carbon having the power of reducing those unstable complex bodies into simple stable gases.

Upon this reducing action of carbon M. Riché based the principle of his gas generator, and by its means all the volatile products of the distillation of wood—or, indeed, of any other combustible matter, such as peat or lignite—are reduced into simple and stable compounds, thereby producing three times the volume of a rich, permanent gas that was formerly possible. No purifiers

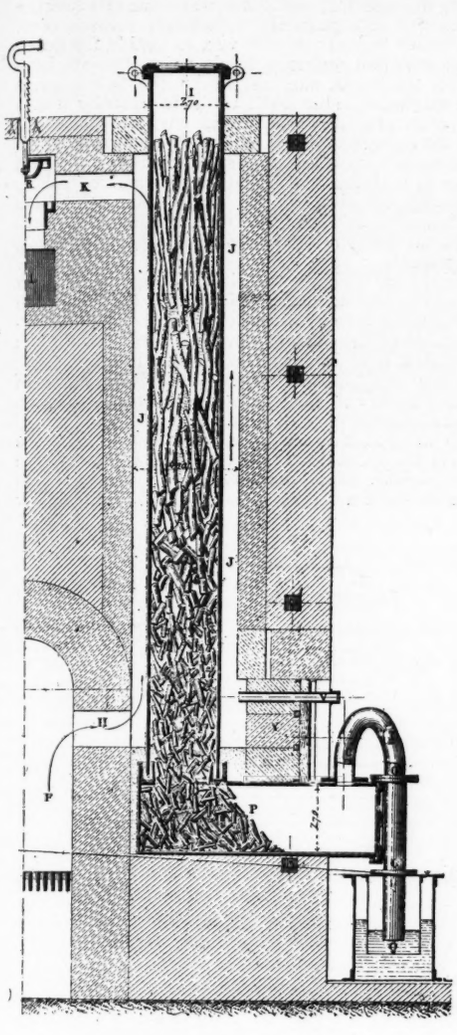


FIG. 3.—VERTICAL SECTION OF RETORT.

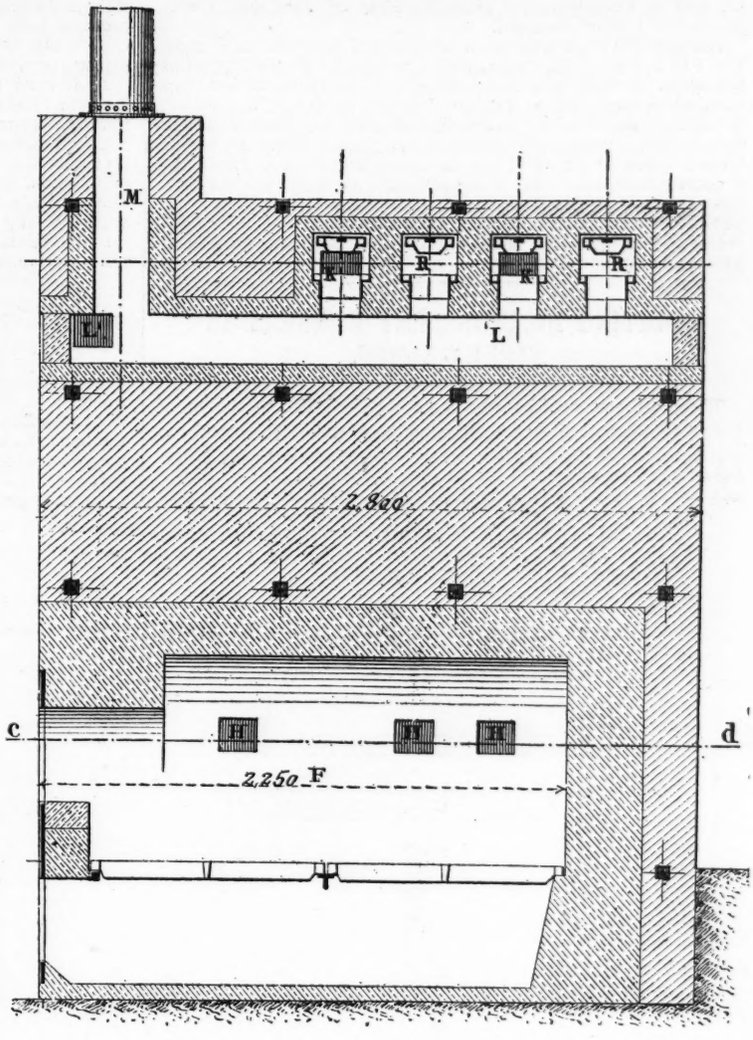


FIG. 4.—VERTICAL SECTION OF GENERATOR THROUGH FIRE-BOX (LINE *f*, FIG. 2).

are needed, and the only other product is a good charcoal, which pays in a great measure for the first cost of the wood.

Some idea of the properties of Riché gas may be formed from the figures in the following table of analyses of the principal gases used in the industries:—

Kind of Gas.	Composition in 100 per volume. Hydrogen.	Carbon Monoxide.	Carbon Dioxide.	Nitrogen.	Hydrocarbons.	Calories per Cubic Metre.
Siemens	25·7	4·5	69·8	—	—	773
Dowson (anthracite)	18·4	26·8	7·2	47·0	0·6	1345
Dowson (coke)	21·9	15·9	11·4	5·1	0·7	1018
Water	49·2	43·8	2·7	4·0	0·3	2884
Coal (average)	49·6	9·6	1·6	3·8	35·4	5250
Riché	44·2	22·0	21·3	—	12·7	3029

From the above table it may be seen that what was formerly the poorest of all gases—wood gas—can be made a rich gas, nearly approaching coal gas.

In the Riché generator the products of distillation are purified before leaving the retort, being caused to pass through a thick layer or a column of incandescent carbon residues (resulting from previous distillations), which are renewed by the addition of the residues of successive charges. The generator is composed of a kiln of ordinary red and fire bricks, inside of which are placed the retorts, which are heated by fire-boxes at the end of the kiln. These fire-boxes are so arranged that the heating of the kiln can be shut off or started at a moment's notice by a series of dampers. Usually only one fire-box is provided; but each or any retort can be cut out and changed or repaired without interfering with the action of the others.

The construction of the Riché plant is shown in the accompanying diagrams, in which figs. 1 and 2 represent a side elevation and plan, while fig. 3 is a vertical section through one of the retorts, and fig. 4 a vertical section through the fire-box.

The apparatus consists of a gas-furnace having vertically-arranged retorts, which are heated from outside to a red heat—say, 800° to 900°—by flames of a furnace with a heating chamber in the central part of the masonry. The retorts I (fig. 3), which are made of cast iron or other suitable material, may be of any convenient shape. They are arranged vertically, and bear at their lower part on a horizontal and cylindrical piece at P, which the inventor calls a "thermal filter," or "purifying apparatus." The retort and the cylindrical piece are united by means of a rib-and-groove device, in which is inserted a refractory mastic compressed by the weight of the retort, and which is allowed to expand itself freely upward. The head of the retort is closed by a cover, and the cylinder by a door of any convenient construction. Behind the furnace is arranged the central heating chamber F, in which openings H are provided, leading to the vertical flues J, composed of fire-brick, wherein the retorts are placed. The several flues are set in communication by means of the conduits K and R, with a main conduit L, leading to the chimney M (fig. 4). Damper doors are arranged at the upper part of the conduits K. Every horizontal cylinder P, upon which bears the retort, is fitted with a curved and diagonally-arranged pipe O, causing the products of the distillation to pass through the washing apparatus Q, from which they are discharged through piping, either to the gasholder or the apparatus in which they will be utilized.

The generator works in the following manner: The furnace being lighted, the air passes across the fire-grate, and the fuel is converted into Siemens gas, which mixes with the air entering through the fire-door. This gas is burned in the form of long flames in the central heating chamber, wherein the combustion is perfected. The burned gases then pass at a very high temperature through the openings H, to the vertical flues J, rise along these flues, and flow across the conduits K R (provided with damper door), and the main conduit L to the chimney. When the apparatus, and in particular the retort, has been brought to a sufficiently high temperature, the latter is opened, and charged with a small quantity of coke or charcoal, so as to fill the rear part of the cylinder and the lower part of the retort, as is shown in fig. 3. When this coke or charcoal has been raised to a red heat, the retort is charged with wood to be distilled, after which the cover is closed and tightened. Then the distillation commences, and the resulting gases are filtered by passing through the incandescent column of coal in the lower end of the retort and in the cylinder, where they are thoroughly purified by destroying the whole of the tar vapours and converting into carbonic oxide all their proper elements.

By the Riché system, 1 ton of wood produces upwards of 25,000 cubic feet of gas and about 400 lbs. of good wood charcoal. It is claimed that 1-horse power can be obtained at a cost of less than

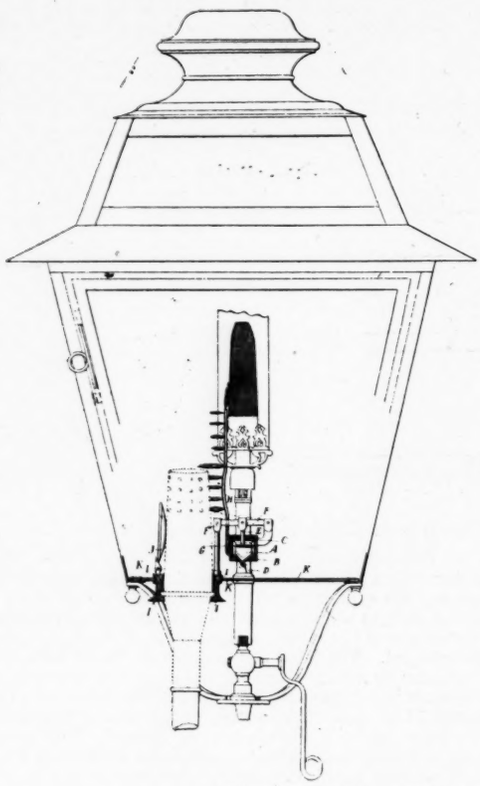
¼d., and at a consumption of nearly 6 lbs. of wood with a bye-product of ¼ lb. of charcoal.

The gas has been applied to a variety of purposes in France. There is a plant at the shops of the Chemin de Fer de l'Ouest at Levallois, for welding and enamelling; besides which it has been adapted to uses such as drying chemicals, smelting glass, solder, brass, &c. The chief use, however, to which it has been put so far is for producing motive power with gas-engines. There are now a large number of plants of this description in France furnishing 1 horse-power-hour with a consumption of from 900 to 1200 litres (32 to 42 cubic feet) of gas, and at a cost of 0·3d. to 0·6d. per effective horse-power-hour. For this purpose, in colonial and out-of-the-way districts, where wood is plentiful, Riché gas should prove useful.

LIGHTING INCANDESCENT BURNERS IN STREET-LAMPS.

Those of our readers who have watched the "Register of Patents" columns since the introduction of the incandescent gas system of street lighting, are aware that a number of arrangements have been devised for lighting the burners. The object in view was to effect this operation as expeditiously as possible without damaging the mantles; and those who have attacked the problem have arrived at a generally satisfactory solution of it. One of the difficulties to be overcome was to enable the lamplighter, provided with the ordinary torch, to manipulate both incandescent and flat-flame burners, where the two systems happened to be employed in his district. This difficulty it was that M. Auguet attempted to overcome in devising the street-lamps shown in the accompanying diagrams, by the use of which he claims that the gas can be instantaneously ignited by the aid of the pole, even in a strong wind—the lamp being completely closed before, during, and after lighting. The system, which was recently fully described in "Le Gaz," can be adapted to both internal and external ignition—fig. 1 showing the former and fig. 2 the latter arrangement.

Taking first fig. 1, the appliance consists of a gas-box B, into which the gas enters from below. The inlet is connected with the pipe D, which supplies the burner, by means of a small elbow-pipe. From the side of the gas-box starts the feed-pipe for the igniting-tube or pilot light H. The box is fitted with a valve A, furnished with an india-rubber washer C, which, by means of the lever F, having on its end a counterweight, exerts pressure on the valve, and hermetically closes the gas inlet at the bottom of the box; the top being shut by a copper screw stopper G, in the centre of which is an opening for the passage of the rod of the valve E. The top of this rod is connected with the lever F. The counterweight consists of a copper cylindrical ring I, the upper



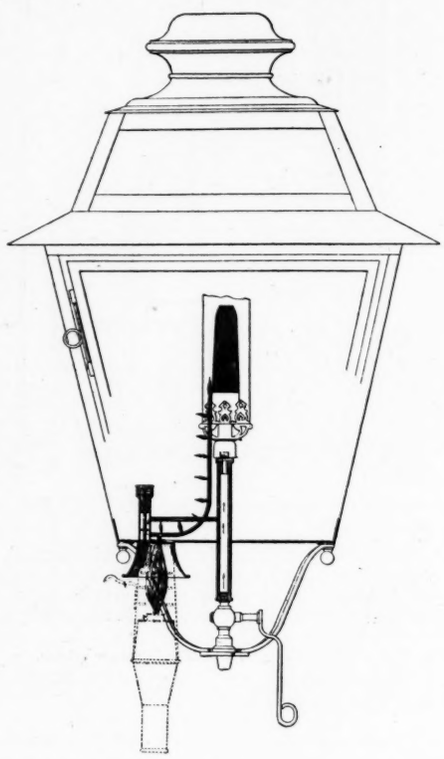


FIG. 1. THE AUGUET LAMP-LIGHTING ARRANGEMENT. FIG. 2.

opening of which is closed by a valve J, having a hinge-joint and buffer-spring; the lower part widening out like a funnel to allow the lighting-torch to pass through. Inside the ring there is a projecting piece against which the torch strikes. At the top it is joined to the lever, and kept in a vertical position by the copper hoop K, in which it slides. This hoop forms part of the bottom of the lantern, to which it is fixed.

The method of lighting is as follows: The lamplighter first turns the tap, and then passes the torch through the ring I. The end of the torch raises the valve J, and comes in contact with the projection in the ring. By using a little pressure, the lamplighter raises both the ring and the valve A, so that gas can enter the box B, and supply the igniting-tube. When the lower part of the valve rises to admit gas into the box, the top part presses against the under side of the stopper, and prevents the gas from passing through the hole containing the valve-rod. The light in the torch being at this moment opposite the holes in the igniting-tube, the jets are lighted, and the flame is communicated to the burner. The lamplighter then withdraws the torch, and by so doing allows the ring to fall and press against the valve which at once shuts off the gas from the tube, leaving only the burner itself alight.

The arrangement for external lighting is composed of the following parts: (1) A copper cup to receive the torch; (2) a buffer button, with rod inside the cup, which allows the gas to enter the igniting-tube; (3) a distributing-tube containing a valve with a spiral spring; (4) a small vertical supply-pipe conveying gas from the central pipe to the distributing-tube, and the igniting-tube conveying gas to the burner; (5) the central pipe, of copper, screwed on to the lantern cock by its lower end, the burner being attached to the end of the pipe; (6) the transverse copper band to which the whole appliance is fixed.

Ignition is effected in the following manner: The lamplighter turns on the gas with his torch, and then places the end of it in the cup. He next presses it upwards, resting the top against the button which bears upon the spiral spring. The valve rises, and allows the gas to enter the lower part of the distributing-tube and feed the igniting-tube which is in contact with the flame of the torch; and the burner is lit instantaneously. The lamplighter removes the torch, which, by ceasing to press against the button, allows the valve to fall on to its seat. The gas is then cut off from the igniting-tube, and the light extinguished. The whole of this is done by a single movement.

The Royal Meteorological Society have published in their "Journal" an account of the bequest made to them by Mr. G. J. Symons of those of his books, pamphlets, maps, and photographs of which copies were not already possessed by the Society, and exclusive of works specially relating to rainfall. As a result, some 6200 books and pamphlets and 900 photographs have passed into the library of the Society, including some valuable works on rainfall to which Mr. H. Sowerby Wallis generously yielded his prior claim.

CAST-IRON PIPE MANUFACTURE.

Concluding to-day our report of the transactions at the winter meeting of the British Association of Water-Works Engineers, we have to summarize the proceedings on the papers dealing with the subject of the manufacture of cast-iron pipes.

Mr. A. G. Cloake submitted the first; and it dealt with the practice in France. He said that the cast-iron pipe industry has developed by leaps and bounds during the last few years; and much of its success is, no doubt, due to the very practical and workmanlike methods adopted by the French engineers and iron-founders. France is now a competitor in both our foreign and home markets, and having the advantage of such shipping ports as Antwerp, Hamburg, Havre, &c., where the lowest freights are obtainable, is securing a share of a department of trade which was originally entirely in our own hands. Unlike the American pipe-founders, the French founder is an ironmaster, and is fully alive to the advantage of obtaining a complete analytical knowledge of the iron used. Naturally, this study has its reward; and by close application to experiments, and the mixing of the different grades of pig iron, a result is obtained which secures castings of the first quality—being dense, tough, and of a close-grained nature.

Casting pipes vertically is the only method accepted by the French engineers, even in the case of such small diameters as 1½, 2, and 3 inches. The pits for these pipes are built both circular and rectangular, and measure respectively from 30 ft. to 40 ft. diameter, and 35 ft. by 20 ft., with a depth of 16 feet. This depth is necessary because of the standard lengths of pipes, from 9 inches diameter and upwards, which are usually made to lay 13 ft. 2 in., socket to socket.

The system of straining the molten metal adopted by the Société Metallurgique d'Aubrives et Villerupt is that devised by the Managing Director, M. Jacquemart. This permits of the socket being cast upwards, with a feeding head from 8 to 12 inches above the socket, according to the size. Under this system, the spigot ends are rendered very dense, owing to their solidifying under pressure, and truly cylindrical and concentric castings are also obtained.

The pattern of socket mostly adopted by engineers on the Continent and abroad is similar to that used by the Post Office authorities in London for cable pipes, and admits of a straight pipe being set at an angle of 1 in 24 without allowing the pressure of water to come in contact with the caulking material, as the spigot, even at this angle, sits tightly on the seating of the socket. As it is seldom that a line of pipes is laid perfectly straight, and difficulties invariably arise in making the joints at all angles and curves, the advantage of employing the socket and spigot above referred to will be readily appreciated. The greater lengths of pipes used on the Continent also effects a saving in the jointing, owing to the reduction in the number of joints. The risk of leakage is also reduced for the same reason.

The standard lengths of cast-iron pipes in use on the Continent are, as has already been stated, longer than those adopted in this country. The following table gives a comparison between the French and English standards:—

French Pipes.		British Pipes.	
1½in. and 2in. to lay 2½ metres	(8ft. 2 in.)	2in. to lay	6ft.
2½in. to 8in. ,, 3 ,,	(9ft. 10½in.)	2½in. to 15in. ,,	9ft.
9in. and upwards 4 ,,	(13ft. 9 in.)	12in. and upwards ,,	12ft.

The saving in the cost of laying secured by the longer lengths totals up very considerably, when the reductions in jointing material, weight of sockets, weight of lead and yarn, and in men's time are taken into consideration.

The weights of French pipes are about the same as English vertically cast; but owing to the quality of metal used, the French founders claim to be able to work a lighter specification under similar conditions as regards pressure.

The coating for pipes generally used in France is Dr. Angus Smith's process; the pipe being re-heated and lowered into a hot bath of the solution, as in this country. The ordinary test is generally 20 atmospheres, although this is sometimes increased to 800 feet head of water in special cases.

To give to cast-iron pipes a greater resistance against shocks, M. Jacquemart has introduced the system of winding steel wire, under pressure, round the extremities of the pipes, and in grooves cast in the body of the pipes. It is essential that the steel bindings should be of the same durability as that of the cast iron; and to secure this, asphalte is put on at high temperature, which penetrates the spaces between the coils, and completely covers them. This is kept in place by the edge of the grooves; so that the whole forms a block of great strength, perfectly impermeable, and absolutely proof against oxidization. The results of experiments with these steel-bound pipes show that it is possible to avoid a burst with a large main; and the behaviour of the pipe under such conditions as sudden and instantaneous shocks, shows that pipes of this type are absolutely proof against fracture, and even when strained to the point of fracture, the damaged parts remain in their original position. A cast-iron main of this type, 2 metres (78 inches) in diameter, has been laid in connection with the water supply of Paris.

Mr. S. H. Terry, M.Inst.C.E., read the second paper, which described the practice in England. He said he hoped to prove that in pipe founding we are determined to be in the forefront, and are not going to permit the intelligent, and withal industrious, foreigner—be he French, German, or American—to beat us in cost of production or quality.

In the early days of pipe founding, the absence of keen competition in the trade, or of rigid specifications, had not induced the practice of casting pipes too thin, and thus creating one of the most fruitful sources of trouble. This tendency to unduly restrict the weight of pipes arises from two causes—first, from the desire to lessen the weight to be paid for, and, secondly, to save freight charges by rail or sea. This desire to economize may, however, be bought too dearly. The saving of metal and weight, in order to reduce the freight charges, may lead to increase in the number of wasters during manufacture, and in damage during transport, due to insufficient strength—all of which losses have ultimately to be borne by the buyer. Thin pipes cost more per ton to mould and cast. A greater proportion, too, of extra pipes have to be provided per mile, for it must be borne in mind that a cast-iron pipe cannot be looked upon as a portion of work until it is laid and jointed; and, for any given depth of trench, the cost of such laying and jointing (including trenching) is practically the same for a given size pipe whether it be thick or thin. It may therefore be accepted that reduction of weight beyond certain limits is false economy; and there are often occasions when it would be much truer economy to put down pipes of greater weight. Endurance, tightness of joints, and power to resist shocks are all favoured by the use of the thicker pipe; while the longer life more than repays the extra first cost. With some waters there is also the question of rust, when the thicker the pipe the more material remains available to resist the pressure of the water after either internal or external rusting has taken place; while, similarly, in some places, wasting from electrolysis has to be provided against.

On the occasion of a recent visit to the Woodside works of Messrs. Cochrane and Co., of Dudley, the most approved system of pipe founding was in full operation. The pig, which is carefully selected, and for the most part smelted on the premises, is of special selected quality, having a very close grain and high tensile strength. The coke, too, is burned on the premises, and is as free from sulphur as any which can be obtained. Smooth turned and faced cast-iron patterns are wholly used for the standard sizes of pipes. The pipe moulds are all grouped concentrically in pits round suitable radial cranes, and some twelve cupolas are in constant use, and melt from 150 to 200 tons of iron per day. Pipes of all sizes are cast with a considerable head of metal, which is afterwards cut off; it serving the double purpose of providing a space in which any impurities in the molten iron may accumulate, and of exerting a suitable pressure—thus causing the iron to fully feed and fill the mould during preliminary cooling. At the Woodside works, all pipes are carefully tested by hydraulic pressure; various tests being specified and employed, ranging from 300 lbs. per inch upwards. There are a number of pipe-testing machines on the premises, so situated that the pipes pass them on their way to the barge wharf, before reaching which they are (if proved satisfactory) heated and dipped in Dr. Angus Smith's composition, consisting of a mixture of gas tar and pitch. The largest testing-machine will take 48-inch pipes of standard length; and by the use of ingenious hydraulically moved caps, the operation of centering a pipe weighing 6 tons, filling it with water, putting on the pressure, emptying and passing it into the roller path, does not take more than 10 minutes per pipe. An intensifier situated near the large pipe-testing machine will give any pressure up to 1200 lbs. per inch. On the occasion of the author's visit, large numbers of 42-inch pipes were being cast for the Birmingham Water-Works. These are 1⅛ inches thick, and have steel hoops shrunk on at the socket end.

A table of the standard sizes, thicknesses, and weights of cast-iron water-pipes adopted by Cochrane and Co. is appended:

Diameter.	Thickness.	Length.	Weight.		
Inches.	Inches.	Feet.	Cwt.	Qr.	Lb.
2	3/8	6	0	2	0
2½	3/8	6	0	2	14
3	3/8	9	1	0	14
4	3/8	9	1	2	0
5	7/16	9	2	0	0
6	7/16	9	2	2	0
8	½	9	3	3	0
9	9/16	9	4	3	0
10	5/8	9	5	3	14
12	5/8	12	9	0	0
14	5/8	12	10	1	0
15	¾	12	12	3	0
16	¾	12	13	3	0
20	¾	12	21	0	0
24	¾	12	25	0	0
30	1	12	35	0	0
36	1	12	43	0	0
42	1	12	50	2	0

Cochrane and Co. do not recommend a less thickness than from 1⅛in. to 1¼in. for pipes of 42in. and upwards in diameter.

A description of the American practice was supplied in a very complete abstract (not read) of a series of articles which were published in "The Engineer" in the first half of this year. The

abstract (which occupied 27 pages of octavo printed matter), with a tabular plate, was prepared by the Secretary, Mr. Percy Griffith; and, during the meeting, he was complimented on the manner in which he had executed his self-imposed task.

Discussion.

Mr. H. Ashton Hill (South Staffordshire Water Company) said he thought it would be well if many water engineers, instead of writing elaborate specifications for pipes, were simply to tell some of the reputable pipe-founders that they wanted pipes of a certain diameter, and let them supply them. Mr. Cloake, in his paper, stated that the French founder was an ironmaster. He (Mr. Hill) thought that the English pipe-founders were also ironmasters, and that many of them had efficient chemists who looked into mixtures of iron, and followed the process through from scientific and chemical points of view. The same author described the quality of French pipes as being "dense, tough, and of a close-grained nature." This was a terse definition of what a pipe should be; but some engineers specified the various brands of pipes, and put a lot of things into their specifications about which they knew nothing. It seemed that French makers cast the whole of their pipes vertically; and it was desirable that English manufacturers should universally adopt this practice. France also seemed to have a market for 1½ and 2 inch pipes. They were used to a small extent in this country, and might probably be employed with advantage to a large extent. Then he saw they used pipes 13 ft. 2 in. long; and he could not see why 13 or 14 feet pipes should not be used in this country, and so gain the advantage which accrued from the employment of longer pipes. The difficulty was to obtain uniformity; but he thought they ought to try to help the matter forward by using their own influence. Referring to "shocks" in pipes, he mentioned an instance where he had a pressure of 150 lbs. on the pumping-main, and burst four 20-inch Y branches. The founders were putting a bolt through the weak part, with wrought-iron bands on the socket ends; and, by this means, he was hoping to overcome the trouble. As to the question of putting ribs on special pipes, the pipe-founders did not agree with this; believing that it was better to thicken up the whole pipe if necessary, because of contraction. In such cases, the French pipes, with wire wrapped round them, would be very advantageous. But, of course, the question of price would come in. As to Mr. Terry's paper, he agreed that it was a mistake to reduce the weight of pipes for the sake of getting the price down. Coming to the American paper, he pointed out that it was stated that the annual output of water and gas pipes since 1896 was 600,000 tons. The works comprised in the Pipe Trust, they were told, had a capacity of 3000 tons a day; and, taking 300 working days a year, they had 900,000 tons as the capacity of the works. Then for works independent of the Pipe Trust, they had a capacity of 1450 tons per day, which gave them 435,000 tons a year. Therefore they had a total capacity of 1,335,000 tons; while the output was only 600.000 tons. If these figures were correct, they meant that the pipe foundries of America were only half employed.

Mr. C. E. Jones (Leyton) agreed that a little extra weight placed upon a main would ensure its longer life; and this was of considerable importance to the well-being of the distributing apparatus of a water-works. Money so spent was money well spent, because they all knew the inconvenience, difficulties, and cost of repairing fractured mains, which could in many cases be avoided by having a little extra metal in the pipes. He did not mean to say that they should make the pipes unduly heavy or unduly thick; but there was a margin which common-sense dictated. Pipes were now calculated too near their working load; and there was not sufficient margin allowed for shocks and rough transit. Then there was the external and internal corrosion; and on this score a little extra weight in pipes was an advantage. It was a surprise to him to find great stress laid upon the fact that pipes were cast vertically in foreign countries. In his experience, there was no pipe foundry in this country—except those of the very smallest and having very little pretension to be called pipe foundries—that did not cast their pipes vertically. As to casting pipes socket downwards, he could never see the advantage of this. The socket was usually made thicker and stronger. A socket very seldom gave way, and did not require to be cast downward for the purpose of giving it strength. He would rather have a socket cast upwards; and the weight of the extra iron that was put into the socket would tend to consolidate the even length of pipe beneath. He considered the winding of steel wire on to straight pipes a work of supererogation; but in irregular pipes—such as tees—the introduction of the wire might be an advantage. The question of electrolysis was mentioned by Mr. Terry; and he (Mr. Jones) regretted time and circumstance did not appear favourable for its discussion. The evil which the electric fluid did to cast-iron pipes was a crying one; and it was one which would command the attention of the Legislature before very long. The Americanizing of the streets by electric tubes and trams would render the question imperative. There could be no doubt that for water and gas engineers, there was great trouble in store. As Parliament had sanctioned gas and water and other services being placed underground, surely Parliament were not going to allow other people to come in and destroy them by electric currents without sufficient cause.

Mr. C. Sainty (Windsor) thought the greatest point for them to consider was as to having a standard for pipes. He was somewhat conservative, and believed that pipes could be made equally well in England and Scotland as in America or on the Continent; and all they wanted in this country was a standard for every pipe-founder to make his pipes and sockets to. Long pipes were an advantage where they were running a long, straight length of main; but in towns where they had short streets of many turnings, 9-feet pipes were quite long enough.

Mr. W. Matthews (Southampton) held that it might be of considerable advantage if they could have some sort of general standard for pipes up to heads of (say) 300 feet. Most water engineers now bought to a large extent from makers' stocks; and there was no reason why they should not give some encouragement to the makers to have uniform stocks. He thought this was a work the Association could take in hand; and this would not be going too far at the present time, seeing that they now numbered some 300 members representing works which were all large users of pipes. It was a serious mistake on their part, as engineers, to unduly cry up British manufacturers simply because they were British manufacturers. They ought to give every encouragement to the views of the pipe manufacturers of the United States, France, and Germany. If they were content to accept what the British manufacturers gave them to-day because it was British, and beguiled themselves that they had no right to demand anything better, then they would never get anything better than they had to-day. They ought not to take such an attitude at all. What he held was that, if, from any cause, the manufacturers of the United States or France could give them something better than was produced in England, then they ought to encourage British manufacturers to bring themselves into line with foreign manufacturers. It was their duty to get the best article they could, no matter where it came from. As to the winding of pipes with steel wire, before they could say whether it was right or wrong they wanted to know what saving of metal there would be by adopting this system, what was going to be the cost as compared with the ordinary system, and what the one pipe would do as against the other.

Mr. James Lees (Tonbridge) disagreed with Mr. Jones as to the casting of pipes. They all knew from practical experience that in caulking a joint, it was the weakest pipe they were driving outwards and not inwards; and unless there was some solidity in the pipe, they ran a chance of splitting it. He thought it would be found that the solidity of pipes was much greater when the sockets were cast downwards. He had tried both English and American pipes; and he did not find any advantage, except that the Americans made their pipes in 12-feet lengths, instead of the ordinary 9-feet lengths. He had put in American pipes for 220 lbs. pressure to the square inch; and certainly he found that they met requirements. But he had put in English pipes equally good. Though the Americans did for a time supply them with pipes at a lower price, it only seemed to him as a kind of bait in order to get their hands in. Altogether he preferred the English made pipes to any other kind. And when they had pipes that were cast vertically, and by a firm who were large manufacturers, he did not think they need have any fear as to getting pipes equal in price and quality to any others.

Mr. W. Ingham (Torquay) mentioned that the Stavely Iron-Works now supplied pipes in 12-feet lengths. In regard to coating pipes, he asked whether any of the members had had any experience with pipes doubly dipped; and, if so, whether they could give him the increased cost, and whether they found the pipes a greater success than single dipped ones. He quite agreed that the time had come when they ought to have some standard worked out to a certain formula or otherwise founded on practice. With this in view, he had prepared a schedule of thicknesses derived from various formulæ. He distributed copies, remarking that there must be something wrong when they got as great a variation as was shown in this schedule. There was need for standardization; and he hoped that the Association would shortly take the matter up.

Mr. R. S. Lloyd (London) said it was quite refreshing to hear engineers speaking up for English manufacturers. He did not think any English manufacturer would say that he knew everything. The manufacturer was quite open to receive a specification from a consulting engineer who had found out that certain methods or practice or results were obtained abroad, and who wished to put them into a specification. Standardization was for the manufacturer a question of the greatest interest; and there could be no one better able to put this matter forward in a way in which it would be acceptable to both engineers and manufacturers than the esteemed President of the Association. The Institution of Civil Engineers had now a very important Committee sitting with regard to the standardization of manufactured steel, and that seemed to him to possess greater difficulties than the question of pipes and mains. Respecting the French paper, he said that surely there must be some means of producing mains sufficiently strong by making them a little thicker, or of welded or riveted steel, without going into the system of strengthening described by the writer.

Mr. J. F. Cullen (Deal) asked whether it was not due to imperfect annealing that so many of the fractures were due in pipes. His experience had been that, where sockets were split, it was not so much owing to the caulking as to the amount of heated metal that was run into the joint. If more careful attention were given to the annealing of pipes and specials, they would have little complaint to make of their manufacturers.

Mr. P. H. Palmer (Hastings) said it had recently been his lot

to lay a pumping-main, six miles in length, formed entirely of American pipes, 16 inches diameter, and $\frac{7}{8}$ inch thick, cast sockets upwards. He gave his experience to show that, besides the point as to keeping the trade in one's own country, there were other ways by which a municipality or company might have to "pay the piper"—above the saving, such as there actually was in this case, of something like 10s. per ton on the cost of the pipes. He had used many thousand tons of English pipes; and he must say that almost entirely they had given satisfaction. He had seldom had a socket fail; but, in the case of these American pipes, they had to stand a constant working pressure equal to 550 feet head. When the pipe-line was laid, he found that something like 30 per cent. of the pipes had split at the spigot. This might have been due to the fact that they were shipped in bad weather and rusted, and there was no means of testing them to their proper head until the pipe-line was practically completed. A tremendous number of the spigots were cracked, but to so small an extent that, when the pressure was removed from the pipe, they could not find there was a crack in it. In the long run, this job cost the ratepayers £2000 over and above the saving in the actual cost of the pipes. He also spoke of the inconvenience of having the pipes delivered all at once. In the case referred to, they all came in two cargoes; while a good English firm would have supplied them as wanted, and the work would have been consequently got on with more expeditiously.

Mr. W. G. PEIRCE (Richmond) said, as to the trouble of getting a breeches pipe to stand the pressure of water in pumping-mains, he had noticed great difficulties and very serious accidents. His son in Calcutta had had experience in the same way, and had got over the difficulty by using an ordinary T-piece in the place of these special castings. The change had turned out satisfactorily. There was much less friction in the water passing into the T-piece compared with the breeches pipe or angle branch.

The CHAIRMAN (Mr. Frederick Griffith) agreed as to the necessity of arriving at some understanding with reference to the manufacture of cast-iron pipes. If the Association could determine upon some common action as to the adoption of a certain standard gauge of pipe sockets and cast-iron patterns as a whole, and endeavour to get their other brethren in the profession to join hands with them, he believed they would arrive at a basis which would be acceptable not only to the profession, but to the manufacturers of cast-iron pipes throughout the kingdom. Then if engineers changed from one foundry to another, they would get a uniform pattern.

Mr. TERRY, in reply, said he did not think England was afraid of competition when it was carried on on all-fours. Some engineers wanted things done all in a hurry; and to this he attributed the fact that many engineering orders went out of the country. As to electrolysis, it was purely a question for the electrical engineers to see that they provided a properly insulated system with return currents. But they saw that this would cost money, and no doubt thought it was so much the better for them that there were water-mains in the ground. But water engineers did not turn their water into the electrical cables, and they did not want the electric current turned into their water-mains. It was not merely a question of the breaking up of the streets; it was a question of a town having its water supply cut off, to say nothing of other serious accidents. Therefore, from every point of view, he agreed that the Government should step in and deal with the matter, and not entirely so from the point of view of the electrician. He thought, if a Committee were formed of some of the best known water engineers, metallurgists, and electrical engineers, they might be able to arrive at some common-sense understanding on this question. Now was the time to do it; not after a number of mains had been seriously injured. With modern appliances, it was as easy to make 12-feet pipes as 9-feet lengths; but, of course, they were not so easy to handle.

LAYING PIPES UNDER WATER.

We have from time to time given particulars of systems adopted in laying pipes under water. Work of this nature was carried out at Boston (Mass.) not long ago, and the details have been published. Two lines of 36-inch cast-iron pipes $1\frac{5}{8}$ inches thick laid under the Mistic—a tidal river 1100 feet wide at high water—were lowered into their place in sections of 70 or 80 feet each, this length being made up of six pipes. Three separate kinds of joint were used. Where flexibility was necessary, a spherical turned surface on the spigot had lead run between it and the approximately similarly shaped bell. These allowed a deflection of 1 in 10 in any direction. An ordinary leaded joint could be used for all the other pipes, except at the ends of sections, where a taper turned spigot was put into the last bell before it was lowered, and lead run round. The spigot was then drawn out, and formed the first pipe of the next section. When a section was being lowered, it was supported by a girder-like truss, having fixed to its near end a hydraulic cylinder with an iron rod and hook attached to the piston, by means of which the spigot end of the new section was dragged into the bell end of the last. This was a rather expensive process, and it was found that the total cost was twice that of the pipes—a diver being necessary both for directing and caulking.

A more useful method was one adopted at the Chelsea Creek crossing. Here the stream was tidal, 1450 feet wide at high, and 600 feet wide at low water; the maximum depth in the latter condition of the river being 25 feet. There was a good deal of navigation, with which, of course, the works could not be permitted to interfere. In this case, all the joints were alike—ball and socket leaded joints, similar to those used on the Mistic; and they allowed a maximum deflection of 1 in 6. They were laid continuously in a previously ridged trench, down an 80 feet radius curved slide suspended from the side of a large scow. This slide was 75 feet long; and its shoe was adjusted to the bottom of the trench by the smaller of two derricks on the scow. The larger derrick supported the body of the slide and its load of pipes. The shoe end was lowered with its load where the channel crossing began, or where at low water the end of the pipes would be exposed. The scow was warped on 12 feet, allowing the pipes to slide so far down the cradle. Another pipe could then be inserted and leaded on the cradle above water, after which the scow was warped a further pipe-length.

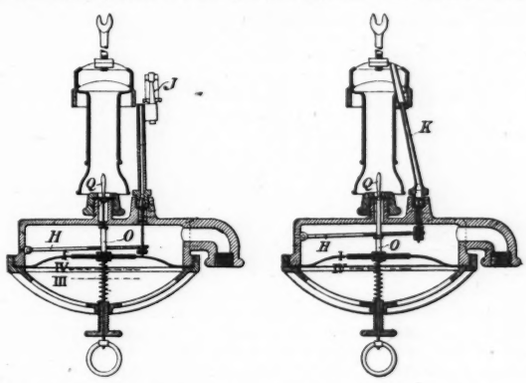
REGISTER OF PATENTS.

Coal and Coke Conveyors and Elevators.—Dempster and Sons, R., and Broadhead, J. W., of Elland. No. 22,058; Dec. 5, 1900.

The invention relates to push-plate or scraper conveyors, elevators, or plate-belts, for conveying or elevating coal, coke, or any other material. The primary object of the improvements is to carry the push-plates, scrapers, rakes, or the like for operating the material to be conveyed, along the trough or the plates in plate-belt conveyors, by chains located outside the trough, and adapted to ride or roll over flanged rollers supported in stationary bearings. The chains and the rollers and bearings are thus removed entirely from the trough, and kept clear of the material being conveyed or dealt with. The rollers also act to guide the chains and accessories of the conveyor or elevator or the plate-belt in practically a straight line; and, by the preferred construction of chain used, prevent them or the plate-belt from fouling with, or rubbing against, the structures or frames to which it is applied. [The arrangement referred to was described and illustrated in the "JOURNAL" last week, p. 1596.]

Automatic Gas Igniting and Extinguishing Pressure Device.—Sefton-Jones, H.; a communication from C. Fader, of Mendoza, Argentina. No. 1770; Jan. 25, 1901.

The present invention (illustrated in two forms of construction) is designed to fulfil the purpose of lighting public gas-lamps simultaneously without further attention from the gas-works, or in the case of domestic lights from a pressure-regulator inserted in the gas-main in the house itself, and "even of regulating the lights and of extinguishing some of them during the night and the rest of them simultaneously at dawn."



The gas-igniting apparatus consists of a casing on which is screwed a ring, and between the two is fixed the edge of a flexible leather diaphragm. On top of the casing is a screw-threaded nipple to which is attached the burner. There is also on the casing another nipple into which is screwed either a small pipe on which is set a revoluble spongy-platinum igniter J, or else a small gas-pipe K which opens in a conical pipe attached to the burner, and forming with this latter a small ignition-flame bye-pass burner.

In both figures, O is a cut-off and pressure-regulating rod firmly connected with the diaphragm, while below the diaphragm is a spring, the tension of which can be adjusted. The ring at the lower end of the rod O serves to control the ignition-mechanism when the latter is under the day pressure. The upper end of the rod is in the shape of a slender cone Q, which serves to regulate the flame of the burner with varying gas pressures.

The spongy-platinum igniter operates in the following manner: If the burner is out of operation—that is, when the gas cock of the lamp is turned off—the diaphragm is in its highest position, and the double valve plug attached to the rod O closes the upper valve-seat. Consequently, the valve-plug on the flash-light closes the aperture of its valve-seat. After the turning-on of the cock (which, when the lamp has once been put into operation, always remains open), the diaphragm with the day pressure still remains in position I., as the spring which is adjusted to this pressure presses from below, and no gas passes to the burner and igniter. About a minute after the day pressure has been increased at the gas-works to the maximum, the diaphragm is pressed down into the lowest position III. Consequently, the rod O sinks and closes the lower aperture by the valve-plug. Meanwhile, the stop on the rod has

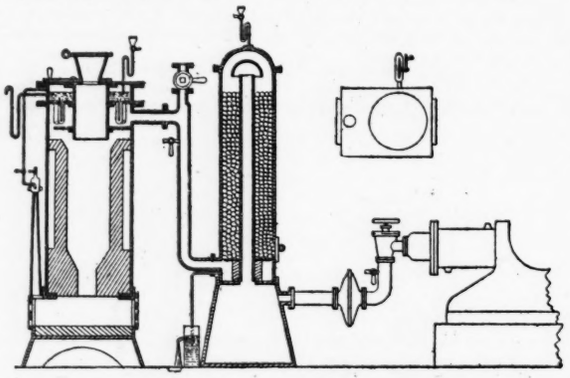
pressed the lever H downwards, which opens the passage in the valve-seat so that gas passes to the igniter. After lighting has taken place, the maximum pressure is adjusted from the gas-works to evening pressure, in consequence of which the diaphragm again rises to correspond into the position IV., and lifts the rod O, and gas passes through to the burner, and ignites at the ignition-flame. Immediately afterwards, the lever H is released, and the spring in the flash-light plug presses the valve on its seat, and the passage of gas to the ignition-flame is cut off. To extinguish the lamps at dawn, the pressure is reduced at the gas-works to the day pressure. Consequently, the diaphragm rises into the highest position I., and the double valve-plug closes the aperture of the valve-seat, and cuts off the gas supply to the burner.

The gas-igniter with bye-pass igniter operates as follows: When the burner is put in operation for the first time, the diaphragm is in its highest position I. (as shown). The rod O is also in its highest position, and closes the upper aperture in the valve-seat. Accordingly the lever H is also in its highest position on the stop, and thus releases the aperture in the valve-seat of the igniter. On opening the gas-cock (which subsequently remains always open), the diaphragm, with day pressure, still remains in the same position I., as the spring which is adjusted to this pressure presses from below. Gas now flows immediately to the small igniter (which is ignited once and for all). As soon as the ordinary day pressure has been increased at the gas-works to evening pressure, the diaphragm is forced down to position IV. The rod O thereby sinks, and the plug opens the passage in its seat so as to allow the gas to pass to the main burner for ignition. Meanwhile, the stop has released the lever H, whereupon the spring on the flash-light plug presses down the valve-rod, and so the ignition-flame goes out. To extinguish the flame of the lamp, the morning pressure (from midnight to dawn) is again adjusted from the gas-works to day pressure. Hereupon the diaphragm rises to its highest position, the stop raises the lever, and consequently the valve-rod with its plug, so that the passage in the valve-seat is freed, and gas passes to the bye-pass burner and ignites at the still burning main flame. The latter then goes out, as the valve-plug closes the passage in the valve-seat.

In case a number of lamps are to be extinguished during the night, a spring like that below the diaphragm is inserted in the respective lamps in such a manner that they are extinguished at a pressure between the maximum evening pressure and the day pressure which is adjusted at a given time from the gas-works.

Gas-Producing Plant.—Oswald, T. H., of Queen Victoria Street, E.C., and Bowman, F. E., of Knutsford. No. 17,292; Aug. 29, 1901.

This invention relates to a combination of gas-producing plant for use in direct communication with a gas-engine, the motive power of which is furnished by the gas generated by the plant and drawn from it by the engine when at work.



The generator (as shown) consists of a vertical metal casing lined with fire-brick, having near the bottom a solid hearth or furnace, and supplied with fuel through a hopper at the top, capable of being closed in any convenient manner. On a flange at the top of the generator is bolted an annular vessel, open at the top, and covered by a metal plate to form a steam-boiler. The bottom of the boiler is drilled to receive "Field tubes," which project downward into a chamber formed by a tube bolted to the under side of the boiler and a disc secured to the outside of this tube near the bottom. The disc fits the interior of the generator; and a portion of it, at the periphery, is cut away to allow the heated gases to enter the chamber which contains the Field tubes—an outlet from the chamber on the opposite side conducting the hot gases to a scrubber. To the steam-space is connected a pipe which opens into a small chamber fixed on the top of an aspirating-pipe, and provided with holes controlled by an adjustable cover for the admission of air, which, together with the steam, passes through a pipe to the furnace or hearth chamber.

The scrubber consists of a vertical cylinder, having a central vertical pipe open at the top, and at the bottom communicating with a gas expansion chamber preferably placed immediately below the scrubber to form its base. Above the open end of the vertical pipe is a bell or deflector, to spread the washing water admitted through the top of the scrubber, and prevent it from passing down into the gas-expansion chamber. Around the pipe are a number of baffle-plates. Near the bottom of the scrubber is an outlet for the washing water, sealed by a syphon. The scrubber is packed with coke or other suitable material. The gas-expansion chamber is in direct communication with the engine by which the gas is to be consumed. After a charge of fuel has been introduced, a fire is lighted in the furnace. A tap on the gas-passage outside the generator is then opened to the atmosphere; and a blast of air is temporarily forced into the furnace by a fan or other appliance, so as to blow up the fire. This is continued until the fuel is in a state of efficient combustion. The gas generated passes upward into and round the chamber, thus heating the water in the Field tubes, and rapidly converting it into steam. This is aspirated along with the air into the bottom of the generator; and, being decomposed in its passage through the incandescent fuel, it produces carbonic oxide and hydrogen, which pass out along with the gas through the open tap into the atmosphere. The gas is allowed to escape in this way until sufficiently rich to burn continuously by itself. The large tap is then closed, and the gas passes into the scrubber (where it is cleaned as it flows upwards), and thence under the bell or deflector down the vertical pipe into the gas-expansion chamber, and thence to the engine. This may be started in the ordinary way; and as soon as it begins to run, each revolution aspirates through the combined apparatus the gas required for each explosion, and consequently no further blast or other forced draught is required to promote combustion.

APPLICATIONS FOR LETTERS PATENT.

25,077.—Anderson, J. C., "Meters." Dec. 9.
25,092.—Boult, A. J., "Gas-generators." A communication from F. M. Hille. Dec. 9.
25,120.—Statter, J. G., "Gas or oil engines." Dec. 10.
25,126.—Thompson, W. H. & R., "Controlling the flow of steam, water, or other fluids." Dec. 10.
25,128.—Thatcher, C., and Renshaw, J., "Valves for fluids under pressure." Dec. 10.
25,139.—Hills, H. G., "Combined gas-generating plant and gas-engine." Dec. 10.
25,157.—Davidson, G., and The Fietz Preliminary Syndicate, Ltd., "Manufacture of illuminants." A communication from C. Fietz. Dec. 10.
25,180.—Phelps, E. W., and Nadeau, T., "Incandescent gas-burners." Dec. 10.
25,193.—Andrews, G., "Utilizing the heat given out by the explosions in gas-engines, turbines, and like motors for the purpose of obtaining motive power." Dec. 10.
25,270.—Baader, H., and Rau, E., "Electric gas-lighters." Dec. 11.
25,281.—Passmore, F. B., "Atmospheric gas-burners." Dec. 11.
25,323.—O'Connor, H., "Prepayment gas-meters." Dec. 12.
25,332.—Hills, H. G., "Internal combustion motors." Dec. 12.
25,339.—Hood, D. W., "Incandescent oil-gas burners." Dec. 12.
25,353.—Moeller, J., "Bunsen burners." Dec. 12.
25,394.—Imray, O., "Regulating the pressure of gas." A communication from E. Coppée. Dec. 12.
25,411.—Stumpf, J., "Steam or gas turbines." Dec. 12.
25,493.—Holmes, E. D., "Extracting tar from illuminating gas." A communication from O. N. Guldin. Dec. 13.
25,494.—Holmes, E. D., "Duplex valve for gas-purifiers." A communication from O. N. Guldin. Dec. 13.
25,495.—Holmes, E. D., "Mouthpieces and lids of gas-retorts." A communication from O. N. Guldin. Dec. 13.
25,516.—Warren, W. P., "Generation of acetylene." Dec. 13.
25,521.—Scholl, A., "Gas densifying and exhausting apparatus." Dec. 13.
25,552.—M'Kay, G. H., "Gas-cock." Dec. 14.
25,558.—Pollard, R. W., and Davis, J. L., "Electric cable, gas, and water conduit." Dec. 14.
25,565.—Cuff, A. B., "Automatic regulators for gas-burners for heating purposes." A communication from J. C. Cuff. Dec. 14.
25,566.—Mackenzie, J. W., "Acetylene gas machines." A communication from E. S. Titus. Dec. 14.
25,590.—Boult, A. J., "Incandescent gas-burners." A communication from J. Braunstein. Dec. 14.
25,611.—Green, W. O., "Coin-freed meters." Dec. 14.

Boston (Lincs.) Public Lighting.—The Lighting and Paving Committee of the Boston Town Council have recommended the Corporation to invite three or four firms to present competing schemes for the generation of electricity for lighting the town and for motive and traction purposes—the selected firm to work the plant for a period of years on certain terms, and the Corporation to have the option of taking it over at the specified date. In the meantime, the lighting of the town is to be improved by the introduction of incandescent gas-burners. Possibly their installation will render unnecessary the adoption of any one of the competitive schemes, supposing they are submitted.

The Water-Works Bill of the Wolverhampton Corporation.—At a special meeting of the Wolverhampton Town Council, held on Monday last week, Alderman J. Marston (the Chairman of the Water Committee) moved the approval of the Corporation Water Bill and the appointment of a Parliamentary Sub-Committee. He said that last session a like Bill was thrown out of Parliament; but on the present occasion a number of alterations had been made. In the first place, the Corporation would not apply to extend their limits of supply. In the last Bill, it was contemplated to include a number of parishes outside their present area of supply; and, as a consequence, considerable opposition was offered. All clauses relating to this matter had been dropped out of the Bill. In the second place, the Corporation offered to supply water to existing premises within 2 miles of the proposed new works, in the event of the present supply of water failing after the new works are in operation. This was regarded as a distinct advantage to the inhabitants of the neighbourhood, as the present source of supply was of an unreliable character, whereas the supply provided by the Corporation would be under pressure and continuous. In the third place, the Corporation were offering local authorities on the line of route a supply of water at a fixed rate per 1000 gallons, so that they could ensure a regular supply to the whole of the residences. The previous Bill sought power of inspection over lands in the neighbourhood of Cosford Brook; but this was now left out. The estimates for the new works were practically the same as before, when the amount was fixed at £145,000. This time the sum was £149,000, as it was intended to increase the area of land for the works. For the general purpose of providing for the growth of the town and district, the sum proposed to be borrowed was raised from £55,000 to £101,000; making the total amount £250,000. Mr. Parkyn seconded the motion, and it was agreed to.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Dura Mantles and the Welsbach Company's Advertisement.

SIR,—I have been consulted by the Guaranty Incandescent Mantle Company (the United Chemical Works) in reference to the libellous and highly damaging advertisement appearing in your issue of the 17th inst. In that advertisement it is stated that interim injunctions have been obtained, and confirmed by the Court of Appeal, in respect of (amongst others) the "Guaranty" or "Dura" mantle sold by my clients, the United Chemical Works. This is a wholly misleading statement. As a matter of fact, the Lord Chief Justice of England decided—as you know—that during the pendency of the action against the United Chemical Works or Guaranty Incandescent Mantle Company, the Court could not, and would not, grant injunctions against users or sellers of the mantles of my clients' manufacture. The Welsbach Company were dissatisfied with the Lord Chief Justice's decision, and lodged notice of appeal; and the Court of Appeal dismissed the same. You can, therefore, readily understand that the statements appearing in your paper are likely to do my clients an incalculable amount of injury; and I, therefore, have to ask you, in justice to them, to insert this communication in as prominent a position in your paper as the libellous advertisement referred to.

95, *Leadenhall Street, E.C.*,
Dec. 20, 1901. JONATHAN E. HARRIS.

Is There a Crisis in British Industry?

SIR,—I have read, as doubtless many of your subscribers will have done, the article on the above topic in your last issue. I heartily endorse the sentiments expressed therein respecting the British workman. I am unable to acquaint you with the normal working conditions of several different classes of artisans between the present time and thirty years ago; but I can bear full testimony to the fact that the position of working men in connection with gas undertakings has been vastly improved during that period. In many works, twenty years ago, lavatories were unknown—the stokers and others considering themselves fortunate if they could wash in a bucket either in the retort-house or elsewhere; while the sanitary arrangements were unworthy of the name. Penalties and fines were unreasonably inflicted; Sunday work was all paid for at single time; holidays were practically unknown, in the sense of the time being paid for; and one-sided agreements were forced upon the workmen. One need not magnify the evils existing in the "good old days." The twelve-hour shift arrangement has now pretty nearly been abolished, except in those works where proportionately higher wages are paid; and therefore it is only a matter of mutual agreement.

It is not to be supposed that the past generation were lacking in sympathy and goodwill, though sometimes it was strangely expressed. As an illustration of this, I remember at one works, where the stokers were required to work a double shift on the change week (making 24 hours in all), the Directors provided for the spiritual welfare of the workmen by the erection of a chapel on joists over one end of the retort-bench; and old workmen have told me that they used to have opportunities of attending Divine worship there between the shifts. Later on, in consequence of a chapel being erected in the immediate vicinity, the one over the retort-bench was demolished.

In the light of the present improvements, such as splendid lavatories, mess-rooms, reading-rooms, baths, sanitary arrangements, and higher wages, how strange seem the bare recollections of the past! But this is not the immediate subject of your inquiry. You state you are requiring "irrefragable evidence" to persuade you that the British workman of the present day is one whit a worse man than his forerunner of a past generation. As far as my experience goes, he is fully equal to any of his predecessors. Of course, there are exceptions, which go to prove the rule; and bad workmen are the exceptions. It will be admitted that there are bad masters just in the same ratio as bad workmen; but the percentage in both cases is probably less than it seems at first. The drunken reveller, returning from his midnight carousal, may disturb and awaken the whole neighbourhood; but this does not warrant us in branding the neighbourhood as a drunken one. The drunkard's neighbours are disgusted with him, and he becomes an object of pity if he does not speedily amend his ways. The same principle holds good with regard to bad workmen. They are held in equal disrepute by their fellows, and certainly not regarded as examples. It must not be overlooked that there are, and have been, "jacks in office," who have held their assistants responsible for their own defective designs and arrangements; and have been the first to endeavour to cover their ignorance by depreciating and discounting the British workmen.

Respecting Trade Unions, I do not care one iota if a man is in forty of them, providing he does his work honestly and well. It cannot be gainsaid that Trade Unions flourish best in districts where the tyrant is unfortunately known to exist. For the designing agitators who seek to impose upon the credulity of the British working man, there cannot be one jot of respect; for they will neither work nor sanction others working. These men are the parasites.

It will be well for those concerned to take seriously to heart, before their only opportunity is gone for ever, this question of the treatment of workmen properly, as life is too short to be thrown away by harshness and vindictiveness. Is there not a superior method gradually and surely making itself known and appreciated—namely, that of kindness? It is useless to say that workmen do not accept kindness, and that what is required is firmness. It is well known that both of these conditions are quite compatible. I have frequently read with concern irritating remarks made at meetings of the members of the various gas institutions, to the effect that certain so-called labour-saving appliances would reduce the number of hands (though in many instances this has proved fictitious), and minimize labour difficulties, &c. It is rapidly becoming recognized that the workmen are not merely "hands," but "souls," and as such require to be regarded. In the words of the immortal Burns, in his exquisite poem "For a' That, and a' That"—

Then let us pray that come it may,
As come it will for a' that,
That sense and worth, o'er a' the earth,
May bear the gree, and a' that;
For a' that, and a' that,
It's comin' yet for a' that,
That man to man, the warld o'er,
Shall brothers be for a' that.

How often has it been stated that a good husband makes a good wife; and it can equally be affirmed that a good workman makes a good master.

The statements you quote from American critics may have an element of truth in them; but, on the other hand, one is bound to admit that even our American cousins are not devoid of boasts and brags, *plus* "eternal smartness."

You conclude your most interesting article with the remark that "it takes all sorts of people to make a world;" and you would like, before accepting it, to make sure of the truth of the allegation respecting the British workman that he is the bad bargain he is sometimes reputed to be. This determines your own opinion that he is not. As the law of mutual interdependence between thinkers and workers is becoming better known, possibly in the New Year a better conception of it is likely to be produced by fair and impartial criticisms such as you have given respecting the remarkable articles which have been appearing in "The Times" and other papers.

Huddersfield, Dec. 19, 1901. EDWARD A. HARMAN.

The "Lancet" Tests of Clamond Fires.

SIR,—The "JOURNAL" for the 10th inst. contained a report, reprinted from the "Lancet," of what purported to be an exhaustive series of analytical tests of the above-named fires or radiators. Some of the data, and the conclusions drawn therefrom, were so "peculiar" that, while they might pass unchallenged in the "Lancet," I quite expected to see them questioned when published in the "JOURNAL OF GAS LIGHTING." Had the report been an ordinary "sympathetic" description of some novelty, a little poetic liberty might well pass unchallenged; but published, as these tables and detailed explanations are, with the seal of the "'Lancet' Laboratory" upon them, they will, unless questioned, be taken by many as reliable scientific results. It is due, therefore, to the public and to the gas-stove trade that some of the discrepancies contained in the report in question should be exposed and corrected.

Gas experts who read the report will have already noted some of these errors; and no doubt their confidence in the rest would thereby be shaken. For instance, Table I. informs us that, with 3 inches pressure of gas, a certain fixed aperture in a burner passes 22 cubic feet of gas per hour. Table II. informs us that the same aperture with 2 inches pressure passes 20 cubic feet per hour—*i.e.*, for 1 inch more pressure only 2 cubic feet in 20 feet more gas. Tables III. and IV., however, show results much more "peculiar" than that; for in them we are told that the same burner which passes 20 cubic feet per hour at 2 inches pressure passes only 18 feet when the pressure is increased to 2½ inches! Surely something has gone wrong with the "Lancet" meter!

A very important omission from the "Lancet" tests, especially if the results are intended to be of service outside London, is that lower pressures—viz., 1½ and 1 inch (the latter of which is prevalent as the day pressure in the country) are entirely ignored. It is well known that it is at low pressures that most of the present difficulties arise; and if in this direction lies the weakness of the fires in question, that fact should be known in the places where high pressure is not available.

Passing from necessary criticism of unreliable experiments to practical facts, every right-minded progressive producer of articles of such public utility will hail with pleasure each step made towards greater perfection in appliances, as they tend to stimulate their more extensive use, and inspire the inventive faculties of the craft to reach "another niche the higher."

Dec. 19, 1901. E. W. T. RICHMOND.

Merthyr Water-Works Arbitration.—Mr. G. F. Deacon, who was appointed Arbitrator in the dispute between Messrs. Holme and King and the Merthyr District Council regarding a claim for £6745 for work done at the Neuadd Water-Works other than was provided by contract, and £23,407 for extra expenditure caused by the Council's delay (*ante*, p. 802), has issued his award. The amount which he states is to be paid by the Council to the Contractors is £2036; and the parties will pay their own costs, and each pays half the cost of the award.

Bath Public Lighting.—In connection with the recent unfortunate electric lighting failures at Bath, the Gas Company have addressed a letter to the Bath Surveying Committee of the City Council, in which they offered to substitute for the electric light the most modern lanterns, fitted with incandescent gas-burners, in sufficient numbers to light the streets equally as well as the arc lamps. The Company stated that they were confident that, if this system was adopted, it would effect a saving of at least £2000 per annum on the present cost for the districts now lighted electrically. They pointed out that the City of London and other towns, both in England and on the Continent, had adopted the incandescent gas system in preference to electricity for public lighting. They offered to light a street experimentally. When the letter came before the Committee, Mr. Chivers referred to it as a smart bit of business, and moved that it lie on the table; but the majority held, with Mr. Bush, that if £2000 a year (equal to nearly a 2d. rate) could be saved, it was worthy of discussion. The letter was referred to the Committee who are dealing with the future of the electric lighting undertaking.

LEGAL INTELLIGENCE.

CLERKENWELL SESSIONS.—Wednesday, Dec. 18.

(*Before Mr.* W. R. M'CONNELL, K.C.)

Conspiracy of Workmen to Defraud the Gaslight and Coke Company. The System Explained.

Arthur Thomas Purry, aged 25, described as a clerk, stood in the dock to-day charged with the offence of "wilfully, and with intent to defraud, falsifying certain books and papers belonging to the Gaslight and Coke Company." This is the case referred to in a paragraph in the "Legal Intelligence" last week. Prisoner pleaded "Guilty."

Mr. TRAVERS HUMPHREYS (instructed by Messrs. C. O. Humphreys and Son) appeared for the Company; Mr. ARTHUR HUTTON for the defence.

Mr. HUMPHREYS said the man had pleaded "guilty" to an indictment containing fifteen counts, all charging him with offences under the Falsification of Accounts Act. What he did was to so manipulate books in his possession as to cause the Company to pay very much larger sums for wages to their workmen than were due to them, and then he afterwards shared the proceeds with the men. It was necessary, in order to put the Court into possession of the acts of defendant, to go into detail as to the work with which he was concerned. He was an assistant coke foreman at the Company's works in Great Cambridge Street, Hackney Road; and he had been twelve years in the service. He was first a telegraph boy, and then was promoted until, in 1898, he became assistant coke foreman. The coke was taken from the retort-house to coke-crushers for the purpose of being broken up for sale. It was carried by men in sacks on their backs; and the men who did this work were called "coke backers." In order that the Company might know how much had been carried, a man, called the tally man, was stationed at the spot to count each sack as it was carried by each man past him. The coke backers worked in gangs, and were paid by piecework—1s. 7d. for every ton carried—and, in fact, the men were able to earn extremely good wages at that rate. The duty of the tally man was this: He had to keep what was called the tally-book. He had to put down every morning the names of men employed as coke backers that day; and as each man passed him with a sack of coke, he made a stroke in the tally-book against the man's name. At the end of the day, he added up the number of sacks, and divided that by 20, to find the number of tons that had been carried. At the end of the week—the week in this case running from 6 o'clock on Friday morning to the following Thursday night—the tally man added up the total number of tons that had been carried during the week. The backers had what this worked out to at 1s. 7d. a ton; and the amount due to each man for the week was entered in the tally-book. The prisoner's duty was to keep a book called the coke-crushing book; and in that he had to enter the number of tons that had been carried day by day, and also the total that had been carried during the week. He had to figure out the amount that was owing to each member of each gang—a simple matter of arithmetic, because, in fact, the amount earned by the gang was divided equally among the members of the gang. In order to do this, as the defendant had no personal knowledge of the number of tons that had been carried day by day, he was given by the tally man his book; and his extremely simple duty was to check the arithmetic of the tally man and, if correct, to copy into his coke-crushing book the number of tons that had been carried each day. Having done this, it was his duty next to ask the tally man to sign under the number of tons which he found put into the coke-crushing book; the tally man having to see that it agreed with the amount that he had put down in his own book. The defendant had confessed that what he used to do was, after the tally man had signed the coke crushing book, to alter the total. In this way, supposing 30 tons had been carried, the defendant would erase that number, and put 46 tons. Then he would reckon up what a gang was entitled to for 46 tons; and his practice was, after the men had been paid the wages on that scale, to share with some of them the proceeds from the extra amount paid by means of his falsifying the coke-crushing book.

His LORDSHIP: How many men, because he was corrupting not only himself, but a number of the employees? I want to know how great the number was.

Mr. HUMPHREYS stated that defendant said twelve. In fact, no less than fifty men had been over-paid wages; but whether or not they all knew of this, he did not say for the moment. To continue, it was also his duty to keep a wages-sheet for this department, in which he had to put down the names of the men who were working at the coke-crushing during the week, with the amounts due to each of them, which he would find in his coke-crushing book. Defendant, however, did not stop at falsifying the coke-crushing book, which would have the effect of making each member of the gang receive more than he was entitled to, but he allocated the amount he was defrauding the Company of among certain favoured individuals in the gang. Instead of taking from the book the amounts due to any particular gang, and putting them into the wages-sheet, he put against A. (say) 2s. more than he was entitled to, while B. would get his correct wages, for he was not a personal friend. Thus wages appeared to have been largely overpaid to some men, while the others did not get more than their wages. He further falsified the wages-sheets by putting in the names of men as being entitled to wages for coke crushing who had not that day been doing the work at all, and who were probably engaged upon some other work, and would be paid by some other department. He (Counsel) would give the Court very shortly some figures upon one week and two days, which had been taken for the purpose of this indictment. The week taken ended on Oct. 4 last. The first day of that week was Sept. 27. The amount of coke actually carried on that day to the crushers, as shown by the tally-book, was 34 tons. The defendant entered into his coke-crushing book 50 tons; and wages were ultimately paid upon that basis. On Sept. 28, 26 tons appeared to have been carried, while defendant entered 42 tons. On Sept. 30, 52 tons were carried (it would be noticed the defendant in these figures added 16 tons), and 68 tons were entered. On Oct. 1, 50 tons were carried, and defendant entered 66 tons. On Oct. 2, 38 tons were carried, and he had entered 54 tons. On Oct. 3, 44 tons were carried, and defendant entered 60 tons. The result of this was that during that particular week, the actual wages which the Company ought to have paid for coke crushing was £19 6s. 4d.; while the amount entered by the defendant upon the basis amounted to £26 18s. 4d., or a difference of £7 12s. in that week. The two other days chosen for the purpose of this indictment, to which defendant had pleaded guilty, were Oct. 25 and 28. On Oct. 25, 48 tons were carried. Defendant then doubled the amount, and put down 96 tons. On Oct. 28, 68 tons were carried, and defendant had entered 100 tons. The result was that the excess paid in wages for these two days alone was £6 6s. 8d. To give three instances selected in the case where he had put down men for coke crushing when they were not entitled at all (there were a number of instances, but these were given as specimens). On Oct. 25, a man named Furser was put down as being entitled to 8s. 6d.; while, as a matter of fact, he was not working at all that day on coke crushing, and his name did not appear in the tally book. Then a man named Maskell was put down on Oct. 26 as being entitled to 6s. 6d.; but he was not working on that day. A man named Martin was down on two days that week for 6s. 6d. and 7s. 1d.; but he was not then working at coke crushing. Defendant had confessed that this had been going on for "some months;" that the amount of which the Company had been defrauded was about £100; and that he himself had had about a quarter of the money. Investigation of the books showed that £100 would be somewhere near the mark since last July. It had been impossible to carry the investigation farther back than that, as it meant an enormous amount of research. The books had been cleverly falsified. In a statement made to the officer when arrested, defendant said he was exceedingly sorry, and that he had been led away by men with whom he had been compelled to associate. Then he stated that the falsification was done by first entering the tonnage in pencil, then erasing the figure and putting an extra weight in ink. Also he credited twelve men (whose names he gave) with more money than they had earned in proportion to the extra tonnage falsely entered; and that they equally shared the money. Defendant added that he did not benefit any more than the others; and he was sorry he agreed to the suggestions of the men, who said that others had done the same before, and asked why they should not still do it. With regard to the twelve men, he need scarcely say that careful investigations had been made of the books; and the officers of the Company had considered whether any proceedings could be taken against them, with any ultimate hope of success. It appeared there were difficulties, which had been found insuperable. The men were paid not only wages for coke crushing, but for coke loading at the same time. They never saw the wages-sheets; and this extra amount of £6, £7, or £8 a week, distributed as it was over a large number of men, would mean a comparatively small amount paid to each man. Without any other corroboration of the fact than the statement as to the accomplices by the confessed misdemeanant, the officers of the Company considered it impossible to take any proceedings. With regard to the defendant himself, his position was this: He was paid his wages for the very purpose of standing between the Company who paid the wages and the men who received them. He had betrayed his trust; and for the sake of sharing the proceeds of this fraud, he agreed with these men that they should receive more wages than were due to them. The Court could not lose sight of the fact, however much the other men shared in the proceeds, that this fraud could not have been carried out without the defendant. The system of falsification did not fail in ingenuity; and it was only discovered through a clerical error made by defendant. Then it was found that the wages did not correspond with the amounts in the tally book. In connection with another of the works, a similar charge was now being investigated against a person in the same kind of position. His Lordship would know that one could not carry out a very careful system of checking, nor carry on a business like this without trusting somebody; and it was because defendant had betrayed his trust that the Company viewed this in the light of a rather serious case.

Mr. HUTTON, addressing his Lordship, said he would notice that in the statement made by Mr. Humphreys, he was unable to say whether or not he believed the men acted in conspiracy with defendant. From the very first, this young man had given a full explanation of how the fraud had been committed. He said that the men had been in the habit of receiving certain portions of the money for extra wages which they did not earn; and it was in consequence of the pressure put upon him, that he yielded to their inducements. His learned friend had mentioned the fact that there was another man in exactly the same position, whose conduct was now the subject of inquiry. It seemed to indicate that this kind of thing existed right through the whole of the works. Of course, each foreman would have a great number of men to pay; and here another foreman had done apparently the same thing. This did seem to indicate that what this young man had said from the very first, that certain pressure was put upon him when he was raised to the position of assistant foreman, was the truth. There was no reason why the story should not be true. It was in consequence of the pressure that he made these payments, upon the men constantly telling him that it was a time-honoured—or he should say time-dishonoured—custom among the foremen and men. Having been among them as telegraph boy, he found it harder to remain innocent. He (Counsel) was not trying to mitigate the circumstances. He merely put it before the Court that, although this was a case of betraying an employer, to a certain extent there were exceptional circumstances. His brother had been in the Company's employ for a long period, and his father for a great number of years. Some punishment would have to be passed upon defendant; but he asked his Lordship to pass upon him as mitigated a punishment as he could. Replying to his Lordship, Counsel added that defendant's salary was 30s. a week, having been increased to that figure five months ago.

His LORDSHIP said he could not, beyond the fact that defendant had made some reparation by making a full statement, recognize any mitigating circumstances; for a large business like this must have confidence in the persons put into positions of trust. After being in the Company's service for twelve years, to be led by others, did not appear to

him (his Lordship) to be a mitigating circumstance. Whether the system existed before or not, he did not know; but at any rate, if it did exist, defendant allowed it to go on, and it had permeated all that particular branch of this large establishment. It was a gross breach of trust. He must, therefore, pass a very considerable sentence; and it would be that defendant be imprisoned in the second division for twelve calendar months.

SOUTH-WESTERN POLICE COURT.

Wednesday, Dec. 11.

(*Before Mr.* GARRETT.)

Falsifying a Book at the Nine Elms Gas-Works.

To-day, Alfred Cole, lately coal foreman at the Nine Elms Station of the Gaslight and Coke Company, was charged with falsification of a book of account belonging to the Company, thereby causing them a loss of £79.

Mr. ROBERT HUMPHREYS prosecuted; while Mr. WARBURTON (instructed by Mr. H. C. L. Hanne) appeared for the prisoner.

Mr. *Frederick Beale*, Chief Engineer at the Nine Elms Gas-Works, said that prisoner was in the employ of the Company as coal foreman, and part of his duty was to regulate the removal of coal from barges into the stores. It was also his duty to superintend the removal of coal from one part of the works to another; and he made a return at the end of each week of the work done by the piece-workers, in a book called the coal piece-work wages book. On Dec. 7, witness was present with the prisoner when an investigation of the books was taking place. In consequence of something that was said, prisoner remarked: "I will go and get another book." It was impossible to balance the figures. Prisoner left, and shortly afterwards witness followed him to his office on the wharf, and had some conversation with him. Witness said: "How is it that the figures in the coal-piece work book do not agree with the office return?" Prisoner replied: "I have falsified the returns." Witness then asked him if he had participated in the division of the money, in answer to which prisoner said: "Yes; I am very sorry. I have had good masters, and have only myself to blame." Prisoner then left the works, and they did not see him there again.

Detective Sergeant *Badcock* said he went with a warrant to arrest the prisoner. He read the warrant, and prisoner replied: "I am very sorry I did it; the suspense of the last few days has been terrible." When taken to the station, he made no answer to the charge.

Tuesday, Dec. 17.

Mr. *S. T. Godden*, a clerk at Nine Elms, said it was part of his duty to work out the calculations of wages in the coal piece-work wages book, which was prepared by the prisoner. Prisoner's duty was to enter in the book the number of tons of coal unloaded from different barges in the course of the week, and also the number of tons of coal shifted from one part of the works to another. He therefore had two distinct tasks to perform. He had to enter in the book the rate of wages per ton to be paid to each man (both for unloading barges and for shifting), as supplied to him by the Assistant-Engineer. At the end of the week, the book was received by witness, either from the prisoner personally or by messenger. Witness calculated the wages due in respect of all work done, which was entered in the book from the rate supplied by the prisoner. He was not able to check the work of shifting or removing coal; that was the duty of the Assistant-Engineer. Witness could only check the tonnage of coal brought by barges. Meter tickets were brought to the offices by the master of the barge with each load, containing the tonnage of coal carried and the prisoner's signature certifying that the barge had been unloaded. From these tickets, witness made a daily return to the chief office. He was present in the Engineer's office, on Dec. 7, at the interview described by Mr. Beale, and followed the prisoner into his own office when he left. Prisoner then said he could not find the book which he had gone to look for.

The MAGISTRATE asked what book this was.

Mr. HUMPHREYS replied that it was a purely imaginary one.

Witness (continuing) said he answered that it was absolutely necessary for the book to be found. Prisoner declared that he could not find it, and added: "Will you ask Mr. Beale to come over and see me." Mr. Beale afterwards remarked to witness: "This appears to be another Shoreditch affair. Cole has confessed to having done exactly the same as the foreman there." Referring to the piece-work wages-book for Oct. 13, the entries (with the exception of two columns) were in the prisoner's handwriting. The number of tons now appearing there was 540; and witness entered in the two remaining columns (after calculating the wages) £6 14s. 2d. and the amount due to each man. At that time, however, the figure in the book was 230 tons, made up of 100 and 130 tons, against which was written "amt." (meaning amount). The "amt." referred only to shipping coal; and witness's duty would be to pass that item as correct—for he could not check it—and work out the wages due. Since he passed this item, the names of five barges had been written in; the word "Walrus" having been written over the word "amt." At the time witness worked out the rate of wages, the figure 7d. per ton was written opposite where the word "Walrus" now was; but this figure had since been altered to 3d., which would make the tonnage in that particular instance work out at nearly the same payment as the original 7d. would have worked out at. It would be necessary for the prisoner to reduce the rate to 3d. to make it agree with the barge work. The result of all this would be that each man would be paid the amount appearing opposite his name—16s. 9d.—for work he had never done. With regard to the names of the barges written over the word "amt.," these barges were unloaded during the week; and the tonnage had been entered on different pages of the book, and the wages paid in respect of this tonnage—that, of course, was the legitimate payment. Had the names of the five barges been entered when witness passed the item "amt.," he would have seen that it was a false entry. Witness made out the wages sheets for the week ending Oct. 18; and among the names which he entered were those of the eight men whose names appeared in the prisoner's handwriting in the book opposite the item "amt." Turning to the coal piece-work book for the week ending Oct. 25 (which formed the subject of a second charge), all the entries for Oct. 19, with the exception of the usual two columns, were in the prisoner's writing. The total number of tons now appeared there as 320; but when witness calculated the wages, and made the entry of £6 14s. 2d., and the amount of wages payable to each man, the item was 230 tons—made up as before of 100 and 130 tons. Opposite the figure 100, the word "amt." was written. Since witness passed this item, the names of three barges had been written over the word "amt.;" and the word itself had been altered to "Hamtion"—purporting to be the name of a barge. The figure per ton, which now appeared as 3d., was originally 7d.; the rate having been altered by the prisoner so as to make the amounts agree with the barge work. This made the tonnage work out now at £4. Two of the barges—named the "Penrith" and "Lucknow"—were not unloaded at all that week; and there was no such barge as the "Hamtion." If the names of the barges had been inserted when he passed the item "amt.," witness would have discovered that it was a false entry. He made out the wages sheet for the week ending Oct. 25, including the names of the eight men appearing opposite the word "amt." in the book.

The MAGISTRATE: How was the 7d. per ton arrived at?

Witness: The figure was given to the prisoner by the Assistant-Engineer.

The MAGISTRATE: The wages are paid direct to the men?

Mr. HUMPHREYS: Yes; the prisoner never touched the money. That is our difficulty.

Mr. *A. J. Wilton*, Assistant-Engineer at Nine Elms, said that one of his duties was to instruct the prisoner as to the shifting of coal from the stores to the retort-houses. He computed, by measurement, the quantity of coal to be shifted, and wrote out a voucher showing the number of tons and the rate per ton to be paid for shifting; this rate varying according to the distance to be traversed. He was in the habit of handing these vouchers to the prisoner. After the coal piece-work book had been passed in the office for the purpose of paying the wages, it would come before witness, and he would examine it for the purpose of checking the number of tons of coal shifted from one part of the works to another; but he would not have to check the tonnage of coal brought by barges. Afterwards he would sign the book as having checked the week's work in respect of shifting and rates of pay. He had examined the book for the month of October; and there were entries in the prisoner's handwriting accounting for the shifting of the total number of tons for which he issued vouchers. With regard to the entry on Oct. 13, "230 tons amt.," which purported to show that this quantity of coal had been shifted by the eight men named, it was a fictitious one, as no coal was shifted that day. Had this entry come before witness at the end of the week as it stood, he would have discovered that it was a false one; but when the book did come before him, the names of five barges appeared as now, so that he was unable to check the entry. Had the entry of the word "amt." been a genuine one, there ought to have been a statement of where the coal was shifted from. Witness did not authorize the figure 3d. to be put in. The same thing applied to Oct. 19; no coal was moved that day, and the entry was fictitious. When he saw the book, the entry appeared as at present—with the names of three barges over the original "amt."

Mr. *H. W. Hartridge*, a pay clerk in the service of the Company, said his duty was to pay the wages to the men every Friday afternoon, for unloading and shifting coal. The total amount of wages payable to each man was put into a little tin cup, with a slip of paper stating the amount; and witness handed the men these cups as they came up to be paid, in the presence of the prisoner. For the weeks ending Oct. 18 and 25, the men were paid by witness the sums of money appearing against their names. The men whose names were opposite the entry of 540 tons on Oct. 13 were included in the wages sheets, as also were those whose names appeared opposite the item of 320 tons on Oct. 19.

Mr. WARBURTON said, of course, he recognized that the case must go for trial. It was a very sad one indeed. The prisoner had been for seventeen years in the employ of the Company, and had had to work very hard for his wages. He began service with them as a boy, and had worked himself up to the responsible position he had lately occupied. He had a wife and three children, and was prepared with very substantial bail.

The MAGISTRATE, however, said that he could not see his way to grant bail.

The prisoner, who again expressed regret for what he had done, was then committed to take his trial at the South London Sessions.

CLERKENWELL COUNTY COURT.

Thursday, Dec. 19.

(*Before His Honour Judge* EDGE.)

Gaslight and Coke Company v. Cannon Brewery Company. Incoming and Outgoing Tenants.

This action, which was treated as a test case, was brought to recover £10 1s. 3d. of arrears for gas supplied to premises at No. 388, Harrow Road, to the then tenant Mr. Lowles, who carried on the business of a grocer, with an off-licence for the sale of wines, spirits, &c. The question involved the consideration of section 18 of the Gaslight and Coke Company's Act of 1872, which provides that "in case any consumer leaves the premises where the gas was supplied to him without paying to the Company the rate or meter-rent due from him, the Company shall not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant shall continue the trade or business of the outgoing tenant, and shall have paid to the owner, lessee, or mortgagee in possession, or to the outgoing tenant of such premises, a consideration for so doing." The tenant being in arrear for goods supplied to him, and on the mortgage, the mortgage was transferred to the Cannon Brewery Company, whom

the plaintiffs alleged were liable to pay the preferential creditors; and evidence was given to show that, in fact, they did pay the water-rate and other things of that character. It was also contended that the Brewery Company, who discontinued gas and used electric light, were continuing the trade of the outgoing tenant, who was ousted from possession by the entry of the Sheriff on a *fi. fa.*

Mr. VAUGHAN WILLIAMS appeared for the plaintiffs; Mr. A. H. SPOKES represented the defendants.

For the defence, it was submitted that the Cannon Brewery Company did not come within the definition of "owner, lessee, or mortgagee in possession," and that the Gas Company's Acts gave them no power to sue the incoming tenant for the outgoing tenant's arrears.

The arguments on the construction of the various Acts of the Gas Company were of a very technical and complicated description, and involved a detailed criticism of the case of *Paterson v. The Gaslight and Coke Company*, decided by the Court of Appeal; the plaintiffs relying on some expressions in the judgment of Lord Justice Rigby which the defendants contended were *obiter dicta*. The defendants relied on the judgments of Lord Justices Lindley and Lopes.

His HONOUR, eventually, on the question of fact, decided that the defendants had continued to carry on the business of Mr. Lowles, whose interests had been transferred to the Cannon Brewery Company through an intermediate purchaser. But, as to the question of law, which it was stated was eventually to be dealt with by a higher Court, his Honour said he should take time to consider it before pronouncing a decision.

HIGHGATE PETTY SESSIONS.

Wednesday, Dec. 18.

(*Before Sir* JOHN GLOVER, *Chairman; Dr.* T. BATEMAN NAPIER, *and other Justices.*)

Finchley District Council v. Barnet District Gas and Water Company.

This was an application by the Council for the price to be fixed for water supplied for street-watering and sewer-flushing purposes by the Company.

Mr. MACMORRAN, K.C., appeared for the District Council; and Mr. W. T. FOOTE, K.C., represented the Company.

Mr. MACMORRAN said the application was made for the Bench to fix a price at which the Company should supply the Council with water. The Company, being a statutory one, received certain rights; but obligations were laid upon them, and among these they had to supply any quantity of water for extinguishing fires free and for public purposes, upon the terms under section 37 of the Water-Works Clauses Act, 1847, which were to be agreed upon or, in the event of disagreement, to be fixed by two Justices. This was what was now asked. The water was required for cleansing sewers and drains; and all that was asked was as to the rates.

Mr. FOOTE said the quantity should be limited. If the Council obtained this order, they might demand water all through the season. When the Council were asked not to water the streets during a drought, they declined to acquiesce; and the Company had to stop supplying the Great Northern Railway Company for their engines, and bring their water from the New River Company in consequence. The Company objected to the jurisdiction of the Court.

Mr. MACMORRAN said the Company had charged them 1s. 3d. per 1000 gallons; and this had been paid for many years. The Special Acts of the Company contained no rates for any other than domestic purposes; and the Company might charge anything they liked for trade uses. He believed the Company charged private persons for trade purposes 1s. 3d. per 1000 gallons. The Council found they paid a very large amount, and that other Companies in the neighbourhood charged less. In Middlesex only one authority paid 1s.; and they mostly only paid 6d. and 9d. He asked them to find out the cost of the water, and add the profit to which the Company were entitled.

The CHAIRMAN thought the question of jurisdiction should first be settled.

Mr. FOOTE said section 39 did not state the times when the service was to be given. The section only referred to companies who were bound to give a constant supply. The Barnet Company were relieved from giving a constant supply of water by their Act of 1872. The Act of 1883 modified this, in section 21, by which it was not compulsory for a constant supply to be given; but the Local Government Board might order a constant supply on certain terms. The terms had, however, not been complied with, though the Local Government Board had been called in. The Company were exempted from supplying water at a pressure; and the question as to whether the Private Acts did override the Water-Works Clauses Act was, he thought, clearly in his favour. He argued that the case of *Purnell v. Wolverhampton Water Company* supported his view.

The CHAIRMAN said it was not merely a question of price, but of pressure. In the one case they had jurisdiction without the other.

Dr. NAPIER asked if the words of the Private Act really affected clause 37 of the Water-Works Clauses Act. Were the Company not bound to give a supply?

Mr. FOOTE: No.

Dr. NAPIER said, if section 37 was repealed by the Private Acts, was that not a curious way of doing it.

Mr. FOOTE replied that it was not. The Act did not apply.

The CHAIRMAN thought it left the question of amount to be settled somehow.

Mr. FOOTE: Surely not. We are not under any obligation to give a supply.

Mr. MACMORRAN referred to section 35 of the Water-Works Clauses Act, and said if the word "constantly" was taken out, they had jurisdiction; and if Mr. Foote was right, then they were under no obligation to provide even a domestic supply.

The CHAIRMAN said the Bench were against Mr. Foote.

Mr. MACMORRAN said he was of opinion that the Company could make 25 per cent. profit, and yet supply them with water at 9½d. per 1000 gallons. He gave a large number of statistics showing the price paid by many local authorities in and around the parish. Similar cases had arisen in London; but to a large extent each stood by itself.

Mr. FOOTE said all the Companies referred to by Mr. Macmorran were river companies. The East Surrey Company, who were supplied from wells like the Barnet Company, charged from 1s. to 2s. per 1000 gallons. At Newhaven, 1s. 6d. was charged. The Barnet Company had to take all their water from wells, and to pump it to a height of 300 feet. When the Company's last Act was obtained, the Barnet Council got a price fixed—1s. per 1000 gallons—on certain terms, which were that at this price the water should not be raised more than 300 feet. The District Council of Finchley had now what was in practice a constant supply. The Company had to buy water in 1897; and they had to pay 1s. per 1000 gallons for it. The average cost of the last three years was 7¾d. per 1000 gallons. Then if 25 per cent. was added to that, it would bring it up to 10d. If they paid the statutory dividends, then the rate would be 1s. 5d.

The witnesses present on behalf of the Company were Mr. Henry Rofe, Mr. E. K. Burstal, the Manager of the Company (Mr. T. H. Martin), and the Secretary (Mr. Drew).

Ultimately, the Bench decided that the Council should pay the sum of 1s. 2d. per 1000 gallons.

Incandescent Gaslight Litigation.

Last Thursday, 30 actions instituted by the Welsbach Incandescent Gaslight Company against infringers of their 1893 patent came before the Divisional Court, consisting of the Lord Chief Justice and Justices Darling and Channell. Mr. Walter stated that the cases were before their Lordships upon motion for judgment in default of defence. The plaintiffs were the owners of a patent for manufacturing mantles; and the defendants had infringed it. Their Lordships granted an injunction in each case, and directed an inquiry as to damages. An order was also made for the delivery up of the mantles in the possession of the defendants.

A Reminder of the Ossett Gas-Purchase Arbitration.

A case between the Ossett Corporation and the Ossett Gas Company was heard at the Dewsbury County Court last Wednesday before the Deputy Judge (Mr. Thompson). It was a claim for £42, money practically overpaid. The proceedings arose out of the purchase by the Corporation of the Company's undertaking, following the obtaining of the Act of Parliament. The question of cost was submitted to arbitration; and the amount was fixed at £97,500. Under the agreement, the Corporation were liable to pay the dividend for the half year ending June 29 last; and, as a matter of fact, they had to pay £1636. They were also liable to pay the costs of the Company's opposition to the Corporation Bill, which amounted to about £1800. They also paid the expenses of the Directors, Manager, and Secretary in the promotion of the opposition to the Bill, which amounted to £59, and £28 for expenses of the same gentlemen in connection with the arbitration proceedings. The Directors had voted 30 guineas each remuneration for four Directors, and 20 guineas each to the Secretary and Manager. The amounts voted to the Directors had been repaid to the Corporation; and the present action was to recover the 20 guineas each granted to the Manager and Secretary, which Mr. Shepherd (for the Corporation) pointed out were not within 21 days of the transfer of the undertaking to the Corporation. Mr. Wright (for the defendants) argued that the money had been granted for services rendered, and that the sums were reasonable, having regard to the amount of work done. Judgment was, however, entered for the plaintiffs for the full amounts claimed, with costs.

The Yarmouth Boarding-House Water-Supply Case.

The Yarmouth Magistrates had before them, on Monday last week, the case remitted to them by the Divisional Court on the subject of the basis of the charge on which boarding-houses should be supplied with water (see *ante*, p. 1390). It may be remembered that the Magistrates had held that a boarding-house should have a trade supply; but the Divisional Court directed that the case should go back for the conviction of the Yarmouth Water Company for refusing to furnish a domestic supply. The Company were therefore fined £1 for the refusal, and the boarding-house keeper was allowed £2 damages per day during the week that the supply was withheld, with costs.

Occupying Premises Uncertified for Water Supply.

At the Thorpe Petty Sessions, on Monday last week, before the Rev. Canon Norman and other Magistrates, the Colchester Brewing Company were summoned by the Tendring District Council for failing to obtain a water certificate in respect of their new hotel situated close to the Thorpe Railway Station. Mr. E. Thompson Smith appeared on behalf of the Company. Mr. A. J. H. Ward, the Clerk to the Council, stated that, under section 6 of the Public Health Act, it was necessary that even a cottage should be supplied with pure water before being occupied; it was still more important that a hotel should be so supplied. Mr. Ward gave formal evidence to the effect that the premises had been occupied without a water certificate having been granted. Dr. J. W. Cook, Medical Officer of Health for the district, stated that the supply was obtained from a deep well near the hotel, and he had informed the Architect (Mr. G. H. Page) that this source could not be considered wholesome, as the water contained a large percentage of salt. In the course of correspondence, the Architect had stated that he would get a supply from a stand-pipe of the Tendring Hundred Water Company's system; but this would be beyond the limit of distance from the premises. For the defence, Mr. Smith said that, long before the premises were opened, negotiations were entered into with the Water Company for a supply, and promises were held out that the main would be brought down to the hotel. As soon as it was alleged that the water was not fit for drinking purposes, the Brewery Company arranged to get water from a stand-pipe—the well water being used only for flushing purposes. He admitted that there had been a technical omission to renew the application as soon as the stand-pipe was

put on. As the mains were now being laid, he asked that the case might be adjourned for a week, so that the application for the certificate might be renewed. The Chairman said the majority of the Bench had decided to impose a fine of 40s. and costs, the full penalty being £10.

Wilfully Damaging a Prepayment Meter.

At the Macclesfield County Police Court, last Tuesday, C. W. Cooke, a carter, was charged with injuring, or suffering to be injured, a gas-meter belonging to the Bollington Urban District Council. The Gas Manager (Mr. Henry Froggatt) stated that at the top of every meter there was a screw which, when undone, admitted into the interior of the meter. The screw was covered with sealing wax, which had to be broken before it could be touched. When the screw was undone, the pennies could be got out. The meter used by defendant was brought to the gas-works on Oct. 30 last. It registered perfectly correctly when a penny was put in. There were only a dozen of the kind in use, and all worked properly. When the till was full, a penny could not be forced into the meter; and he had never known of one falling out at the side under these circumstances. John Bradbury, a youth who went round with the collector, deposed that on Oct. 30 he noticed the door to the till had been pushed open a little. He had some difficulty in unlocking it, as it was strained. He opened the door eventually, and removed the box containing the money, and then took the state of the meter. Mr. Allen counted the money; and when he told him that the gas registered by the meter was 31,150 cubic feet, he said it was wrong. The seal had been broken. The wife of the defendant was called, and said the meter was examined on April 2, and again on Nov. 3. Between those dates, the meter got full of money. A young man lodger on one occasion came and asked for a light; but owing to the till being full, and it being impossible to put in a penny, he could not have one. He then forced a penny into the meter with a 2 lb. weight; and this may have damaged the seal. As to the money being less, she said they had been using incandescent lights, and they required a smaller quantity of gas. She had tried once to have the money emptied out, but could not get anyone to come from the works. J. C. Cooper, the lodger, gave evidence as to knocking the penny into the meter; and afterwards he obtained a light. The Chairman said the Magistrates could not over look the seriousness of the offence; and they would impose a fine of 40s. and costs, or one month's imprisonment.

Quality of the South Metropolitan Company's Gas.

At the Lambeth Police Court, on the 13th inst., before Mr. Francis, the South Metropolitan Gas Company were summoned by the London County Council on the ground that the gas supplied at one of the testing-stations on the 4th and 5th of July showed an excess of sulphur—17·66 and 17·36 grains per 100 cubic feet. Mr. Passmore, for the Company, admitted that there was a small fraction beyond the quantity allowed by the Act of Parliament; but he said that there were daily testings of the gas at six different stations, and since 1893 there had been no complaint whatever against the Company. As illustrating what an infinitesimal matter this was, the Chief Engineer of the Company (Mr. Charles Carpenter) told him the two burners on the Magistrate's desk would have to be kept burning continuously for ten hours before they would emit the amount of excess now alleged. Moreover, although in July the Company were only allowed 17 grains per 100 cubic feet, the percentage permitted at this time of the year was higher. The Company did everything in their power to comply with the Act of Parliament. His Worship said that the quantity of impurity was very small, and the case did not call for a heavy penalty. He ordered the Company to pay a fine of £5, and 4s. costs.

Boy Burglars in a Gas Office.

At the Swindon Police Court last Friday, three boys, named Ernest Hammond, George Evans, and Harry Trueman, all under the age of twelve, were charged with having burglariously broken into and entered the office of the New Swindon Gas Company at Gorse Hill, Swindon, and stolen therefrom a quantity of gas and coke tickets. Accused pleaded guilty. The office at the works was left properly secured on the evening of Saturday, the 14th inst.; but when the employees went to work on Monday morning, it was found that a small window had been removed, and entrance gained to the office in that way. The office had been ransacked, everything was in confusion, a number of coal and coke tickets were missing, and a quantity of biscuits had been taken away. When arrested, the accused admitted their guilt, and described how they put the smallest of the trio through the window. Hammond and Evans had been convicted before; but nothing was known against Trueman, who, it was supposed, had been led astray by the others. Hammond was sent to a reformatory for five years, Evans was given six strokes with the birch-rod, and Trueman was discharged with a caution.

Alleged Irregularities at Tamworth.—At a special meeting of the Tamworth Town Council last Thursday, the Mayor (Mr. F. Alldritt) moved the adoption of the report of the General Purposes Committee, which recommended that the Town Clerk be instructed to write to the Joint Water-Works Committee stating that serious irregularities in the accounts kept by one of their officials had been reported to members of the Council, and the Council requested the Joint Committee to direct an inspection of the labour books and accounts for the last ten years, and to furnish a report thereon to the Town and Rural District Councils. In reply to questions, the Mayor stated that if the reports were true, one official and about a dozen other individuals would in all probability be implicated. The report was adopted; and the Town Clerk was also instructed to invite the co-operation of the Rural District Council in the matter.

MISCELLANEOUS NEWS.

FURTHER NOTES FROM THE CRYSTAL PALACE GAS EXHIBITION.

The few days which elapsed between our first and second visits to the Crystal Palace Gas Exhibition effected a change which was extremely pleasing. From states of incompleteness and dulness, those stands which were unfinished on the opening day had emerged to perfect condition and brightness. At eventide, a flood of illumination now covers almost the entire exhibition; and even the string of Keith's high-pressure lanterns suspended aloft, the intensity of which on the preceding Saturday evening evoked considerable comment, have the attention of visitors diverted from them by the brilliance now emanating from the floor stands of the Welsbach Company, of the Lucas lamp, of the Inverted Incandescent Gas-Lamp Syndicate, and the lighting of many of the other displays. Between the various exhibitors there has evidently been an enterprising rivalry to reach a high degree of attractiveness; and this has a magnetical influence upon visitors after dusk. We may repeat that the early part of the evening is the best time to see the exhibition in its full glory.

Stands Previously Unnoticed.

This week we shall first describe those stands to which incompleteness or want of time prevented a sufficient reference last week; and then afterwards there are a few points about some of the exhibits of already noticed firms which on the second visit caught our eye, and which are worthy of attention.

As we have been speaking of the lighting, we cannot do better than commence with the belated stand of the Welsbach Incandescent Gas-Light Company. Before proceeding, in justice to the Company, it must be explained to our readers, as it was to us, that the lateness of completion was due to the contractors. It is the first time the Company have placed their exhibition work in the hands of outsiders. On former occasions, we remember that Mr. J. H. Sheldrake has had full control of the arrangements; and the experience then and now is not likely to lead them to submit themselves again to even a mild rebuke for not being up to time. The design of the structure which covers their allotted space may almost be described as a gorgeous one, and it is admirably suited to the effective display of the handsome and divers styles of fittings adapted to the incandescent system. The stand has an interior apartment for the purpose of showing the effectiveness and convenience of the Welsbach light in private houses. On the exterior of this apartment, the roof is extended; and from this extension on three sides is suspended quite a lavish assortment of pendants fitted with Kern burners and Welsbach mantles. On the fourth side are lighted street-lamps and lamps for large interiors and enclosed spaces. The apartment will be found fitted with side brackets of ornate design and a central pendant, which is really a work of art. Most of the former are known as "Louis XVI." brackets; and they are entirely fitted with Nos. 0 and 1 Kern burners, consuming respectively ¾ and 1 cubic foot per hour. The whole lighting system of the apartment is controlled by a switch outside; and the burners being fitted with pilot lights, the visitor is shown how the convenience of lighting up a room from one exterior point can be obtained as easily with gas as with the electric light. The centre-piece is a ten-light chandelier, fitted with No. 2 burners in the middle and with No. 0's surrounding. The pendants on the outside of the stand show that the gas-fitting designer continues the activity of the last few years in meeting the requirements for new and artistic styles in fittings, and for drawing-rooms for fancy habiliments for the burners in the way of shades and other ornaments. We find, for example, shades composed of closely connected strings of small glass beads are being introduced. These may not conduce to the obtaining of the utmost illumination afforded by the mantles, but they aid in meeting the demands of the housewife for novel and pretty decorative devices. Fresh patterns of the "Simplicitas" fittings are found among the others; and an extending "Surprise" pendant must not be overlooked It is on the principle of the old "lazy" tongs; and by the combination of swivels, just as great an extension can be obtained as with the best of the old chandeliers, and without the accompanying ugly weights and chains of the latter, and the nuisance of the water-slide. Among the other fittings, we notice that there is a growing tendency to the dropping globes and lights, after the style of the "Simplicitas." A noticeable illustration of this is one made of oxidized silver, and fitted with two No. 2 Kern burners. The street-lamps are worth inspection, and the Company's self-intensifying lamp can be seen among them. We learn that the little difficulty which was first found of making these self-intensifying lamps wind-proof has been overcome. A cheap form of the self-intensifying lamp for lighting up workshops is noticed. Surmounting the stand at each corner are four 900-candle lamps; but, being situated amid such a quantity of illumination, they are a bit too elevated to call to themselves particular observation. As we anticipated would be the case, the Company have come out well.

A method of lighting and extinguishing gas from a distant point is illustrated by Messrs. Lovell and Co, at a stand in close proximity to that of the Welsbach Company. There are a number of burners exhibited in different positions; each burner having beneath it a controller possessing two independent valves. One of the valves feeds the main burner when the pressure from the main is on; the other feeds only the bye-pass. They are so constructed that, when the greater pressure is on, the bye-pass valve is closed; and when the smaller pressure is on, the main-valve is closed. By this arrangement, it is demonstrated at the stand that it is possible to control an incandescent light from a bye-pass placed any distance away from the burner, instead of requiring the ordinary chain-and-lever arrangement as at present employed. The controllers and burners have been in use in churches and other public buildings where it is desirable to obviate the necessity of having to light or control each independent burner by means of its own bye-pass. Messrs. Lovell and Co., are proposing to

equip any church with their controllers and supply the mantles—taking the entire cost out of the saving of gas that results. No greater proof is required of their strong belief in the efficacy of their arrangement to produce a saving and prevent waste.

An apology is almost due to the Liverpool and London Meter Company, Limited, for not giving an extended notice to their stand last week, seeing that they were ready for inspection as early as the evening before the formal opening. However, we can make reparation now by saying that there are several points about their exhibits which will be brought to the notice of gas engineers on inquiry, and will undoubtedly interest them. This Company make a speciality of prepayment meters, which have six characteristics, the value of some of which can be tested on the spot. They are: Strength, accuracy of registration, facility for price changing, total-paid dials, compactness, and simplicity. Specimens in glass cases and otherwise afford the visitor opportunities for examination into these points. The money-registering dial must be without question a convenience to supplier and consumer; and it provides at once a check upon, and a preventive of fraud by, either consumer or collector. The dials record the total amount of money paid in; but a sealed plate covering pounds and shillings only permits the consumer to see the pence prepaid at any one time, and the amount of pennyworths of gas that he has standing to his credit. The maximum number of pence with which the meter can be charged is ten; and as each pennyworth of gas is used, the pointer on the dial travels backwards until it would, if not recharged, reach zero. The knowledge which this affords the consumer is a convenience to him; and the double registration—total consumption and total money paid—gives the chief inspector a ready surveillance over the accuracy of the meter, and the one form of registration acts as a check upon the other. Price changing can also be quickly effected *in situ* without the aid of tools; and this was demonstrated. All that has to be done is to unlock and remove the cash-box, unscrew a thumb nut, place a penny in the slot, which allows the side plate shielding the mechanism to be displaced, and then take off a small wheel and replace it by one the teeth of which are equivalent to the number of cubic feet to be passed. Another feature which is regarded as a strong point is that the meter can be set to one of two systems at will—either it can be set to deliver gas at any price per 1000 cubic feet, or to deliver so many feet per coin. The attachment, too, is all dealt with in one compact case; so that it is only an operation of a few minutes' duration to transfer the mechanism to another meter. A claim is also made respecting the prevention of leakage by a patent centre stuffing-box. Among the other exhibits is seen a shilling-in-the-slot meter, and ordinary meters of from 10 to 50 lights. A collection of the gas-fittings of Mason and Co., Limited, of Birmingham, are employed in the lighting of the stand. These fittings are of a very high-class character, and some of them are novel in design. Altogether the Liverpool and London Meter Company make an excellent display.

One of the stands on which photographic displays are made was not adequately dealt with last week. It is that of Messrs. Clayton, Son and Co., and it deserves study. In some respects, it should be taken in conjunction with that of Messrs. Graham, Morton and Co., inasmuch as upon it are exposed views relating to the new Granton Works at Edinburgh. While the last-named firm secured the contract for equipping the house, two photographs show that Messrs. Clayton carried out the beautiful piece of engineering work constituting the circular retort-house roof, which is 389 feet long and 100 feet span. A companion photograph is found in the new circular retort-house roof at Saltley; its freedom from other structure revealing the finely-proportioned character of the work. The world-renowned gasholder of 12,158,000 cubic feet erected by the firm at the East Greenwich Works is a feature, and that they completed this monumental work in twelve months is placed on record to their lasting credit. It may be recalled that the holder is 300 feet in diameter, and that the six lifts are 30 feet deep; the top one extending beyond the frame. A picture of a three-lift holder erected at Leeds gives an illustration of the largest metal tank in the world; its dimensions being 242 feet diameter by 41 feet deep. Photographs of gasholders large and small, and erected in all parts of the United Kingdom and the world, evidence a high reputation. Condensers, boilers, storage hoppers, and Shoubridge's inclined retort chargers represent some of the work which the firm have carried out. The photographs are splendidly executed; and the collection must not be passed by.

The exhibits of the Eerste Hollandsche Ijzererts Maatschappij consist of various qualities of bog ore or natural oxides of iron, as supplied from their own diggings; and several samples of spent oxide, showing high percentages of sulphur and prussian blue taken up by these oxides. The oxides are dug from various parts of Holland; and the area of the Company's operations is very extensive—the visible supply amounting to more than 1,500,000 tons, of which some 300,000 tons are in stock ready for delivery. The stall is tastefully decorated with photos. showing the bog ore being dug and prepared for use. After being dug, it is subjected to a sieving process, to render it in the finest condition for use, and is afterwards mixed to definite proportions, so that various qualities, containing more or less ferric hydrate, &c., can be supplied to gas-works, according to the local conditions. By this means, we are informed, the Company ensure uniformity of production, and are able to supply the same quality year after year. The material is then stored under large covered sheds, and thence conveyed to the various ports in covered barges, in order to ensure it being quite dry. The Company are now erecting machinery for artificially drying the bog ore, in order to be able to supply the material in a perfectly dry condition at any time of the year, which will entirely do away with a trouble so often experienced by gas engineers—viz., excessive moisture. They are also erecting large covered sheds in England, to secure prompt delivery of the dried material. The principal agents of the Company in this country are Mr. Charles E. Fry, of Manchester, and Mr. J. B. Macdermott, of Glasgow. The exhibit is indeed an instructive one.

An improved patent fuel economizer is shown by the Clay Cross Company. A feature of this is that the lids of the top boxes are hydraulically pressed in, and the pipes are similarly pressed into the bottom boxes; so that the greater the pressure, the less likelihood is there of leakage. Scrapers are fitted for keeping the pipes clean; and another feature is the reversing gear for the scrapers, which are operated by a 1-horse power engine. The principle of Rushworth's patent conveyor for taking ore or coal to furnaces is shown by a small section; and a sample of lime for gas purification is on view.

A number of photographs are exhibited by the Blast-Furnace Power Syndicate, illustrating the Thwaite-Gardner patent system of utilizing blast-furnace gases, particularly as a gas-engine fuel.

The Silicia Fire-Brick Company show the partially-erected face-work of a setting of retorts, and silica fire-bricks and blocks, ganister bricks and blocks, and silica and ganister cements.

At the stand of the suppliers of the "Economy" gas-cooking stove are to be seen large cookers, and in one instance a boiler is combined for the circulation of hot water. By its means, the visitor is informed, hot water can be obtained throughout a dwelling in twenty minutes, at an average cost of ½d. per hour. A few hot-plates are also exposed for inspection.

Mr. Thomas Bugden makes a fine show with his india-rubber and other goods for gas-works use; and they bear witness to considerable care in manufacture. A variety of gas-bags, tubing, bands, bellows, stokers' mitts, and many other things are to be seen.

The Lanemark Coal Company are showing specimens of various classes of coal, among them being samples of 5-feet gas coal, coking coal, Lanemark cannel coal, and soft bog cannel coal.

New Points from Previously Noticed Stands.

Hidden away at the back of Messrs. Thomas Glover and Co.'s stand (No. 1), we found a most interesting exhibit in a complete meter-testing apparatus, which, as a sample of high-class workmanship, it would be difficult to surpass. Glancing in one's mind over the exhibits, we do not think that there is a single one which equals this in importance and value; and therefore we indeed regard it as a pity that it was not favoured with a more imposing situation. What fine lectures the attendant could then have given to an ignorant and antagonistic public on the scientific care and accuracy with which the testing of meters is carried out! The set consists of two gasholders, fitted with a table for testing either wet or dry meters, with pressure-registers and meters, and with a lantern at the top for testing the lights. At the side of the table, close to the hand of the operator, cocks are provided for turning on and off hot or cold water. The gas can also be regulated from the table, being made to pass direct from the holders or through the meters. This is the type of apparatus that has been supplied to the Rosebery Avenue and several other testing-stations, and it is really a very nice piece of work.

We noticed Messrs. Joseph Taylor and Co.'s stand last week; but since then the exhibits have been supplemented by some interesting drawings, photographs, &c. The decoration and furnishing of the stand has been completed; and the saturator (described last week) standing in the centre of such unaccustomed splendour for such an apparatus attracts the eye. A number of prints of every conceivable style of saturator now contributes to the interest. Illustrations of Wilton's discharger as supplied to Blackburn and Bury are seen; and special among the others is the Southampton saturator, which is a triple combination. At will, it can be used either on the self-emptying, Wilton's discharger, or fishing system. Numerous testimonials and photographs which are produced for the inspection of the visitor disclose an extending demand for the specialities of Messrs. Taylor and Co., not only for gas-works use, but for chemical purposes as well; and this has needed a corresponding provision of premises and means of output on the part of the firm. There do not seem to be any very reliable data regarding what is absolutely required in respect of the capacity of saturators; but Mr. Taylor informs us that he has done something towards this end by cubing out saturators for stock sizes, in order that their capacity may be more in relation to the work required of them. To have such things as saturators far too large for the required duty is certainly a waste. In addition to the solid-lead form of saturator, the firm likewise produce timber-cased ones. We have also been convinced that in work of this special character, the most satisfactory result to both purchaser and maker is secured when ample time is allowed for construction. Like many other kinds of work, it certainly does not benefit by being in any way rushed.

In addition to the exhibits of Messrs. Bryan Donkin and Clench mentioned last week, we notice a very neat-looking carriage motor driving a 4000 cubic feet gas exhauster, fitted with Simms-Bosch magneto-electric ignition. Some new aluminium lubricators are also worth examination.

Last week we made brief mention of the bold exhibit in the centre of the transept by Messrs. Porter and Co., of Lincoln, the principal part of which is a small holder complete in steel tank. We now learn that the holder has a capacity of 250 cubic feet; the floor space occupied is 10 ft. 6 in.; and the weight of the holder is between 35 and 36 cwt. It is suitable for either coal gas, oil gas, or acetylene. The firm have also on view cast-iron retorts, furnace fronts, syphon boxes, condenser-boxes, &c.

Before concluding this further notice of the exhibition, we must correct a typographical error which appeared last week in the notice of Messrs. Cutler and Son's stand. The words "carbonized iron sheeting," should, of course, read, galvanized iron sheeting.

Overcome by Gas.—An occurrence, which might have had a serious termination, took place at Liverpool on Monday of last week. A smell of gas had for some weeks been noticed in the neighbourhood of Florence Street and Luton Grove; and it is believed that the escape was from the main in the street. The gas worked under the pavement to No. 18, Luton Grove (which is occupied by Thomas Clegg, with his two sons and two daughters), finding an outlet in a small closet between the parlour and the kitchen. At mid-day on Monday, one of the sons came home for dinner; and, finding that he could not gain admittance, he forced his way into the house. He found the place full of gas, and one of his sisters lying in the parlour unconscious, having evidently been overcome by the fumes. The girl remained unconscious until 8 o'clock in the evening; but under careful medical attention she gradually recovered.

THE WELSBACH COMPANY'S AFFAIRS.

Advisory Committee's Report—A Severe Criticism.

Just as we were going to Press with this issue of the "JOURNAL" (on Saturday afternoon, in view of the Christmas Holidays), a copy of the report of the Advisory Committee appointed at the last annual meeting of the Welsbach Company came to hand; and in consequence of the intimate relationship existing between the affairs of the Company and those of the gas industry, we determined to lay the full document before our readers in the current issue. The report, which discloses a far-reaching investigation, is as follows:—

1.—The Members of the Committee appointed under the resolution passed by the shareholders at their annual general meeting on 27th of June, 1901, are as follows: The Hon. Philip Stanhope (Chairman), Mr. Thomas J. Barratt (Chairman of A. & F. Pears, Limited), Major-General F. S. Russell, C.M.G., Mr. George A. Touch, Mr. William Whiteley (Chairman of William Whiteley, Limited), Mr. Edgar Williamson (Chairman of Jay's, Limited).

2.—The Committee met for the first time on June 28; and, after appointing the Hon. Philip Stanhope as their Chairman, decided that, before accepting the duties devolving upon them as an Advisory Committee, it was essential to lay down clearly the principles upon which alone they were prepared to act.

3.—The following resolution was accordingly passed:—

"That the Advisory Committee appointed at yesterday's general meeting, to report on the direction and management of the Company in the future, is constituted for the purpose of making a report to the shareholders upon all matters affecting the management of the Company, including the constitution of the Board, and consequently accepts office solely upon the understanding that they are an independent body, having full powers to investigate all and every matter, to examine all officials, and to have access to all documents necessary for the purposes of their inquiry."

This resolution was communicated to the Board of the Welsbach Company, and was acquiesced in by them on the same day.

4.—The Committee then proceeded to appoint as its Secretary and Accountant Mr. W. W. Wright, F.C.A., of 45 and 46, Broad Street Avenue, and as its Solicitor, the Hon. Charles Russell. But, in the course of the inquiry, Mr. Russell, finding himself obliged to be absent from England, to the regret of the Committee resigned his office, while generously refusing to accept any remuneration for his services. Mr. Capel Slaughter was then appointed to succeed him.

5.—The investigation of the Company's affairs has been of an arduous character, involving the examination of Directors and principal officials of the Company, and a large number of expert witnesses, as well as representatives of the trade, wholesale and retail, and other gentlemen, and the consideration of an immense mass of documentary evidence. An exhaustive examination was, however, necessary, in order to present carefully-matured conclusions to the proprietors. It will probably be most convenient that those conclusions, and the recommendations based upon them, should be treated under separate heads.

CAPITALIZATION.

6.—The issued capital of the Company is as follows:—

5½ per cent. debenture stock	£110,000
5 per cent. cumulative preference stock	1,500,000
Ordinary stock	1,350,000
Deferred shares	629,539
	£3,589,539

The debenture stock has no charge on the property and assets of the Company, but has a first charge on income for payment of interest.

7.—The Welsbach Company at its incorporation acquired and consolidated the following undertakings:—

Incandescent Gas-Light Company, Limited.
Austrian Incandescent Share Company, Limited.
Second Austrian Incandescent Share Company, Limited.
Irish Incandescent Gas-Light Company, Limited.
English Incandescent Gas-Share Company, Limited.

8.—The principal assets, other than stock-in-trade and cash, which were transferred to the Company were—

(*a*) Patents (fourteen in number), patent rights and goodwill, valued at the date of transfer in the new Company's books at £1,755,398 16s. 11d;

(*b*) 1257 shares of 1000 gulden each in the Austrian Incandescent Gas-Light Company; and

(*c*) The benefit of contracts under the agreement between the Reconstruction Guarantee Company, Limited, and the Welsbach Company, dated Dec. 10, 1897.

Capital was reserved out of the original issue to purchase the outstanding 243 shares in the Austrian Incandescent Gaslight Company.

9.—The purchase consideration was fixed at £3,258,124, payable as to £226,225 in fully-paid preference shares, £226,225 in fully-paid ordinary shares, £603,500 in fully-paid deferred shares, and as to £2,202,174 in cash, out of which £100,000 was provided for additional working capital.

10.—The net trading profits for the last completed year, as certified in the prospectus, were stated at £209,808, which included £95,196 from the Austrian Company; and on this basis, the price represented over 15½ years' purchase of the profits. But it will be observed that these profits were unprecedented, and gradually fell to their present figure.

11.—The Committee are of opinion that the Company has been enormously over-capitalized, and that the properties transferred to the Welsbach Company by the vendors were so transferred at a grossly exaggerated value. This is the more inexcusable considering that such a large proportion of the purchase consideration was paid in cash.

12.—The Reconstruction Guarantee Company, Limited, who were the promoters of the Welsbach Company, has been wound up. As promoters, they received (subject to expenses) an avowed commission of £365,000, of which £325,645 was payable in cash. The Committee felt it to be their duty to ascertain how far legal responsibility could attach to the Reconstruction Guarantee Company, or its individual members; and they accordingly instructed their Solicitor to obtain the opinion of Mr. R. B. Haldane, K.C., M.P., and Mr. G. P. Lawrence upon the matter. This was done; but the opinion does not encourage the taking of proceedings.

13.—Although no legal redress would appear to be possible, the real responsibility for the excessive over-capitalization of the Company must be shared, in great measure, by the original Board of the Welsbach Company, and more especially by the Chairman, who occupied a position of financial repute, and was naturally regarded as a sponsor for the value of the properties which the Company acquired. The Directors had better means than the public of gauging the values of these properties; and it appears to the Committee that the capital was largely subscribed in the confident belief that, although the price was fixed by the promoters, the enterprise would not have been endorsed by the names appearing on the prospectus, unless, after inquiry, the Directors had satisfied themselves that the enormous capitalization of the Company was justified by the position of the business and the value of its assets. Without desiring to say anything that might unduly cast the whole onus of blame on any one person, or group of persons, the Committee find that the undue inflation of capital has been one of the contributing causes of the difficulties into which the Company has fallen.

14.—The Committee has considered the question of the necessity for a reduction and readjustment of the capital of the Company; and, in their opinion, it is essential that the capital of the Company should be largely reduced. While it is, perhaps, impossible that the capital of an industrial company like the present should have an exact relation to established assets, it should at least be in correspondence with a reasonable estimate of future earnings. The reduction and readjustment of capital did not fall specifically within the terms of the reference to the Committee; and they do not, therefore, submit definite proposals on the subject in the present report. But they suggest that the formulation of a definite plan of reorganization, which should include the provision of additional working capital, should be one of the earliest duties of the future Board of Management, in consultation with the Committee and representatives from the various classes of stockholders. The reduction of capital must, in any event, be upon a sufficient scale to open up the prospect of a fair return upon the reduced capital of the Company, based on reasonable and prudent survey of future prospects.

PATENTS.

15.—The patents, patent rights, and goodwill acquired by the Company, according to the balance-sheet of March 31, 1899, at a cost of £1,755,398 16s. 11d., included the three patents granted in 1885, 1886, and 1894, and numerous improvements and additions thereto. The Committee are of opinion that these patent rights cannot represent, except to the most limited and reduced amount, any appreciable portion of the large sum that was paid for them. The 1885 and 1886 patents have, of course, expired; and that of 1893, which has been the subject of so much legal contention, has less than six more years to run.

16.—Since the Company's formation, the following sums have been spent in legal charges chiefly in bringing actions against infringers or in otherwise protecting the patents:—

Period to March 31, 1899	£11,118 10 4
Year ,, ,, 1900	15,189 8 1
,, ,, ,, 1901	12,548 16 9
	£38,856 15 2

At the present time, the Company is paying more than £1450 per annum as retaining fees alone to legal and other experts.

17.—The Committee record their emphatic opinion that this costly litigation, involving the Welsbach Company in great and unceasing outlay, should be brought as rapidly as possible to a conclusion by securing a final decision upon the points involved. The benefit to the Company has not been commensurate with the large expenditure; and the goodwill of the Company can be better upheld, and, in the opinion of the Committee, ought to have been upheld, by a vigorous commercial policy rather than by endless procedure in the Law Courts.

COMMERCIAL POLICY.

18.—While patents have undoubtedly considerable value in the infancy of a new industry (enabling such a Company as the Welsbach to build up its business without the fear of excessive competition in the early stages of its development), its future success, like that of other industrial companies, must unquestionably depend upon its operations being conducted upon a sound commercial basis—namely, the production of the best articles at the lowest cost, with a view to a large popular sale at a fair margin of profit. To the neglect of this elementary business principle, and to the unwise policy of relying too exclusively on a protected monopoly, the misfortunes of the Company are, in the opinion of the Committee, largely due.

19.—The approximate number of burners and mantles sold since March 31, 1893, has been as follows:—

	Burners Complete with Mantle. Number.	Renewal Mantles. Number.
Year to March 31, 1894	104,278	178,246
Do. Do. 1895	280,480	729,564
Do. Do. 1896	593,467	1,637,821
Do. Do. 1897	929,176	3,096,627
Do. Do. 1898	552,224	4,016,973
	Burners.	Mantles.
Do. Do. 1899	602,159	4,519,536
Do. Do. 1900	549,677	5,027,055
Do. Do. 1901	962,299	8,163,563

20.—The policy of reduction of prices inaugurated more than a year ago was undoubtedly a step in the right direction. The Committee believe that it will be necessary to go even further in this direction, and, at the same time, to revise the present unbusinesslike selling arrangements in certain important respects. They believe that it is by

popularizing the mantles that competition and infringement can be most effectually checked, and the business of the Company largely developed. There is, happily, reason to anticipate that the Company, when in possession of the new factory in course of erection at Wandsworth, with its improved labour-saving machinery, will be able to produce mantles of a superior quality, and at a price which will render the task of competitors and infringers extremely difficult and unprofitable. The Committee have gone carefully into the cost of production of mantles, and the selling arrangements; and, while it is undesirable that these particulars should be stated in a published report, the Committee will be pleased to submit all information to the future Board of Management, and to advise as to the policy to be adopted. The Committee believe that, if their recommendations are carried out, the Welsbach Company, with the reputation in which its products are held, should, under improved organization and better management, with proper methods of distribution, and the stimulus of intelligent and judicious advertisement, be able to develop a popular demand in the near future, which it does not appear too sanguine to estimate at more than double the present output.

Management.

21.—The Committee find that, under the present management, there is an absence of direction and responsibility, largely owing to multiplication of offices, and a consequent waste of resources and energy in nearly every department, which, if continued, must inevitably end in disaster. The present arrangements are extravagant and inefficient. The buying of goods has been particularly unsatisfactory both as regards quantities and prices. There is an overlapping of duties on the part of various officials; and thorough reorganization is necessary.

22.—This reorganization will be a task of some difficulty. The Committee, immediately upon taking up their duties, formally requested the Board to sign no more agreements with employees for a term of years; but many such agreements were already in existence, and can only be terminated by the payment of compensation—a state of things from which the Welsbach Company has already greatly suffered. At the time of the formation of the Company, large sums were paid as compensation to former officials of the Amalgamated Companies, who were almost simultaneously reappointed to lucrative posts.

23.—The staff of the Company includes competent and efficient men; but it requires to be carefully reviewed, and only those members of it should be retained whose efficiency is established. Under new and better management and more direct control, a large saving in salaries and expenditure should be obtained. The whole policy of branch establishments also needs careful reconsideration in the interests of economical distribution.

24.—A General Manager should be appointed; and while it is desirable that he should be possessed of experience in all branches of the industry, it is most essential that he should possess capacity as an organizer and administrator of a large commercial undertaking.

Interests of the Welsbach Company in Other Enterprises.

(*a*) *Austrian Company.*

25.—The Company holds 1431 shares of 1000 gulden each (out of a total capital of 1500 shares) in the "A" capital (representing the gas undertaking) of Oesterreichische Gasglühlicht Actiengesellschaft, at a cost of £1,452,940. The Company is also entitled to three-sevenths of the profits of the "B" (or electric) undertaking.

26.—The Chairman of the Committee kindly undertook, on the occasion of a private visit to Vienna, to make some investigation into the situation of the Austrian Company. It is, of course, evident that the interest of the Welsbach Company and that of the Austrian Company, apart from the possession of the shares in the latter by the former Company, are conflicting; for while it must be the object of the Welsbach Company to obtain fluid from the Austrian Company at the lowest possible price, it must, on the contrary, obviously be the purpose of the Austrian Company to sell its fluid and other products on the most remunerative conditions. It is largely in consequence of the price of fluid having been reduced that the dividend from shares in the Austrian Company has already fallen from 100 per cent. for the year ending June 30, 1898, to 55 per cent. for the year ending March 31, 1901; and a still further reduction must be anticipated. Under these circumstances, the investment by the Welsbach Company in the shares of the Austrian Company, and especially at the excessive price named, must be regarded as most unfortunate. The rights acquired by the Welsbach Company for important considerations to a proportion of the profits of the new electric light, with a prospective interest in the new accumulator of Baron Auer, may ultimately prove of commercial value. But the Committee, without desiring to further discuss this matter, think that the Board would have been better advised if they had restricted themselves to the primary object and original business of the Company, and had devoted their energies to the development of the trade in incandescent gas-lighting appliances.

(*b*) *Kern Burner Patents.*

27.—The large sum of £80,000 in cash was paid for the purchase of the British patents; and these patents, so far as lighting is concerned, are being worked by the Welsbach Company. It is stated by the Chairman that the Company was under obligation to complete this purchase at the date of its incorporation. No other evidence, however, supports this view, in the verification of which no satisfactory documentary proofs have been forthcoming; and the alleged contract was not disclosed in the prospectus. In the opinion of the Committee, it would, under any circumstances, have been an unwise thing to pay such a large sum in cash for a hitherto untried patent; but as the purchase involved the absorption of a great portion of the cash working capital of the Welsbach Company without any reasonable prospect of an early return, it can only be regarded as rash and hazardous in the extreme.

28.—The Welsbach Company also contracted to purchase the Kern patents for Germany, France, Belgium, Italy, Austria, Hungary, Switzerland, Spain, Russia, Sweden, Norway and Denmark, Cape Colony, India, Australia, Egypt, Holland and its Colonies, Balkan States, and various other countries at the price of £200,000, payable as to £100,000 in cash and £100,000 in preference shares of the Kern Burner Company, Limited, a Company subsequently formed to acquire such patents. It was afterwards arranged that the original vendors should receive £100,000 of debentures, on which interest for ten years was guaranteed by the Welsbach Company, in lieu of cash. At a later date, the Welsbach Company granted the Kern Burner Company, Limited, an exclusive licence for heating purposes in Britain, in consideration of a royalty and the rescission of the guarantee of debenture interest.

(*c*) *Kern Burner Company, Limited.*

29.—The capital of the Kern Burner Company, Limited, is as follows:—

5 per cent. debentures	£100,000	held by vendors.
,, ,,	15,000	,, ,, Welsbach Company.
6 per cent. preference shares.	100,000	,, ,, vendors.
Ordinary shares . .	100,000	,, ,, Welsbach Company.
	£315,000	

The ordinary shares held by the Welsbach Company as a result of the foregoing transaction appear in its balance-sheet with the significant remark: "For which no value is taken."

30.—The Welsbach Company has provided the Kern Burner Company, Limited, with £15,000 in cash against debentures, which have no present realizable value, and has advanced further sums (amounting to over £7000 to date) to enable it to carry on its business—it having no working capital of its own. There also appears to be a contingent liability to provide £3000 capital for a Company which has been formed to work the patents in France.

31.—The Kern Burner Company, Limited, was incorporated on Aug. 24, 1899; but it has only published one account—namely, down to Nov. 30, 1900. The total sales had then amounted to £253 14s.; and the loss on trading was stated at £8696 9s. 11d. The number of stoves sold during the year ending Nov. 30, 1901, was 3193; the great bulk being in October and November last. The Board of the Kern Company is identical with that of the Welsbach Company; and the Directors receive no fees, with the exception of Mr. Moeller, the Managing-Director.

(*d*) *Sunlight Company Purchase.*

32.—The Committee are unable to find any reasonable ground whatever to justify the purchase of the Sunlight Company at a cost of £110,000 in debentures, in addition to the obligation to pay a liability of the Sunlight Company, amounting to £3500. That Company was financially *in extremis* at the time of the purchase; and, so far as the Welsbach Company is concerned, there is nothing to show for the large consideration which was paid in order to absorb it.

33.—It may be incidentally remarked that the Welsbach Company recently adopted the extraordinary course of selling the "Sunlight" mantle, in rival establishments, in competition with the recognized mantles and agencies of the Welsbach Company. But this practice has now been discontinued. One result, however, of this course of action has been to confirm the view of the Committee that it is in the direction of popular prices that a great development of business is to be obtained.

(*e*) *Chalmers' Anti-Vibrator.*

34.—The Welsbach Company entered into an agreement on July 15, 1898, to pay a minimum royalty of £3750 per annum for five years, and paid in advance a lump sum of £10,000 in respect of such royalty, but which lump sum was put forward in the accounts at March 31, 1899, as a "commutation." The Welsbach Company was also bound not to use any other anti-vibrator, and contracted itself out of any power to question or test the validity of the patent. The transaction appears to the Committee to have been entered into without due consideration and investigation on the part of the Welsbach Board. The minimum royalty of £3750 per annum is to cover a sale of 100,000 anti-vibrators per annum, whereas less than 100,000 were sold in three years—thus involving in that period a loss of £8000.

Future Policy Regarding Interests in Other Enterprises.

35.—It is difficult to propound any satisfactory scheme for dealing with the Welsbach interests in other enterprises. It has been suggested that a reconstruction of the Austrian Company is probable in connection with the introduction of Baron Auer's new accumulator, and that an opportunity may then occur for regaining effective control of the gas-lighting or "A" undertaking, or for otherwise dealing with the shares in the Austrian Company. The Kern Burner Company, Limited, may in course of time become a dividend-paying concern; and the Welsbach Company may then be able to gradually realize its interest therein. The Sunlight Company purchase does not, in the opinion of the Committee, represent any tangible or realizable asset, present or prospective.

Accounts.

36.—The gross trading profits and the expenses of administration and selling the product since the incorporation of the Company are as follows:—

	Gross Trading Profit.	Expenses.
Period to March 31, 1899	£155,914 19 4	£93,498 10 11
Year ,, ,, 1900	159,029 3 0	101,727 17 10
,, ,, ,, 1901	122,792 10 9	99,293 15 7
	£437,736 13 1	£294,520 4 4

Preliminary expenses, Directors' fees, amount written off stock, and special allowances to the trade are not included in above expenses.

The dividends received from the Austrian Company for the same periods, after deducting all expenses and other payments in connection therewith, are as follows:—

Period to March 31, 1899	£152,680 8 4
Year ,, ,, 1900	74,655 2 10
,, ,, ,, 1901	62,582 6 4
	£289,917 17 6

37.—The Committee (through their Accountant, Mr. Wright) have made a careful examination of the accounts of the Company. Until last year these accounts were kept in an involved and unsatisfactory fashion; but since the appointment, in June, 1900, of a new Chief Accountant, a great improvement has taken place. The Committee's attention has been specially drawn to the remarkable practice which prevailed of distributing large sums of money, received as discount from manufacturers and others dealing with the Welsbach Company, as bonuses amongst the employees of the Company. This reprehensible practice has now been discontinued; but the fact of its ever having been followed is an indication of the extravagant and irregular fashion in which the business of the Company has been conducted.

38.—In a few instances pluralist salaries are enjoyed by officials of the Company in respect of different duties. The case of a former Joint General Manager of the Welsbach Company is one of the most striking; for while as Managing Director of the Kern Burner Company, of which the Welsbach Company holds all the ordinary shares, he receives a salary of £1000 a year, with provision for commission, he is further retained at £500 a year as Technical Adviser to the Welsbach Company, and receives also £1000 a year from the same Company as its representative on the Board of the Austrian Company—drawing also from the latter Company the ordinary fees of about £250 a year as one of its Directors.

39.—Another instance is that of a Director who, at the commencement of the Company, was appointed at £500 per annum, and at the same time made Joint General Manager under an agreement for a period of five years at £1000 per annum. His functions as Joint General Manager were withdrawn on Dec. 31, 1899; but the salary continued to be paid as before. This arrangement was described in the accounts for the year ending March 31, 1901, as a "commutation," although the full salary of £1000 per annum is to continue until the expiration of the agreement on Dec. 9, 1902. In view of these circumstances, it would be hard to believe if it did not appear in the Directors' last annual report, that this gentleman had been selected for the appointment by the Board of the Kern Burner Company, Limited, as a Joint Managing Director of the Kern Burner Company, Limited, at an additional remuneration (of £500 per annum) and a commission on the profits of that Company. The draft agreement was left to the Advisory Committee to settle; and it is needless to say that they strongly disapproved, and the agreement has not been entered into. It is to be observed that if it had been entered into, a state of things would have been set up similar to that which did not work in the case of the Welsbach Company and ended in the abovementioned one-sided "commutation."

40.—In almost every department, there is room for far-reaching economy and increased efficiency. The stock-in-trade, which appeared in the last published accounts as representing a value of £117,215, is, in the opinion of the Committee, considerably over-valued.

41.—A matter calling for comment is the dealing with the reserve, which was used to write off against it sums amounting in the whole to £40,470 3s. 11d., so that the profit appeared in the last two years to be correspondingly increased. In the first instance, £25,000 was placed to reserve out of the profits to the 31st of March, 1899, and that amount was brought into the balance-sheet at the 31st of March, 1900, and all written off, together with the sum of £5470 3s. 11d. taken from the profits to the 31st of March, 1900. The amount written off consisted of £27,658 3s. 11d., in respect of various losses, and £2812 for royalties that related to the previous year. One unfortunate result of this method of book-keeping was that income-tax has been paid on £27,658 3s. 11d. too much for the year 1900. Efforts, however, are being made to recover the tax paid on this amount.

42.—The Committee have had under consideration the action of the Board in regard to the Company's banking account and its transfer in August last from the Capital and Counties Bank, Limited. The Committee desire to record their opinion, which they have communicated to the Board, that there was no justification for this transfer, and have expressed their strong disapproval of the exorbitant and unreasonable terms which the Board had in contemplation in connection with the transaction, and which the Committee declined to sanction.

Closer Association with Gas Companies.

43.—The Committee have had the advantage of hearing the evidence of Mr. George Livesey, Chairman of the South Metropolitan Gas Company. Mr. Livesey has also placed in the hands of the Committee much valuable information with regard to the employment of incandescent mantles in Germany. The Committee cannot do better than quote the opinion of Mr. Livesey to the effect that the future of the gas industry in this country depends very largely upon two conditions: First, the increased employment of gas for cooking and heating purposes; and, second, the more extended use of incandescent mantles for lighting.

44.—For the foregoing purposes, it is necessary that the gas should be of a lower illuminating power; for while in Great Britain the statutory limit is 14 to 16 candle power, in Germany it varies between 8 and 9 candle power. From information derived from a report made on the North Germany Continental Gas Company, it is shown that, in consequence of a low illuminating quality of gas, and of the active co-operation of the gas companies, incandescent mantles are used in certain towns by some 91 per cent, of the consumers; whereas in England the percentage probably does not, at the highest estimate, exceed 15 per cent. in the Metropolis, and must be very much lower in the Provinces. It will at once be apparent how great is the margin for future development in this country; and the Committee are of opinion that it is all-important that the policy of the Welsbach Company should, as far as possible, be directed in co-operation with the great gas companies, whose interests are essentially bound up with their own.

Board of Management

45.—From the foregoing observations, the shareholders will be prepared to receive the unanimous conclusion of the Committee that the various changes necessary in the administration of the Company's affairs can only be adequately met by the election of an entirely new Board, having no connection whatever with the hitherto waring sections within the Company. One of the Directors, Mr. James Head, who joined the Board in 1900, and whose activity the Committee fully recognize, some weeks ago notified to them and to the Board his intention of retiring.

46.—The new Board should consist of not more than five members of acknowledged experience in the direction of large undertakings; and it is desirable that one of them should be a representative of the gas lighting interest.

47.—There is room for economy in the remuneration of the Board. Since the incorporation of the Company, on Dec. 9, 1897, to March 31, 1901, the following sums have been paid by the Company to thirteen gentlemen for acting either as Directors or General Managers:—

As Directors (ordinary fees)	£19,108 5 3
,, (for representing the Company on the Board of the Austrian Company)	6,613 14 0
As Managers and Technical Adviser . . .	8,382 3 9
	£34,104 3 0
In addition to which further sums have been paid by the Austrian Company and the Kern Burner Company to certain Directors and an officer of the Welsbach Company, which are practically charges on the Welsbach Company, owing to its interest in these Companies, amounting to	2,625 2 5
	£36,729 5 5

48.—The duties of the new Board should be chiefly of a consultative character, and directed to a supervision of the general policy of the Company. The direct administration of the business should be in the hands of a General Manager, who must be chosen with the utmost care. The remuneration attached to the office should be partly by salary and partly by commission on the net profits, and sufficient to induce an experienced and capable man of business to accept the position, and give the whole of his time and energies to the management of the Company.

Investigation of Matters not Dealt with in this Report.

49.—The shareholders will understand that a measure of reticence is often desirable in discussing the internal affairs of an important commercial undertaking, whether its business is competitive or monopolist; and the inquiry by the Committee has extended to many matters of importance which it is unnecessary, inconvenient, or undesirable to discuss in this report. For this and other reasons, the Committee, although anxious to be relieved of duties that have proved much more arduous than was originally expected by them, are willing, should the shareholders think it desirable, to continue to act for a further period for the purpose of assisting the new Board in an advisory capacity, thereby obviating some of the temporary inconveniences that might occur from the change in the directorate.

Summary of Findings and Recommendations.

50.—For the convenience of stockholders and shareholders, the findings and recommendations of the Committee on the chief points which have arisen during the course of their investigations are summarized as follows:—

Capitalization.

The Committee find that the Company has been greatly overcapitalized, and that the vendors and the first Board of Directors of the Company are jointly responsible for the exaggerated estimate of the assets acquired by the Company.

The Committee recommend that a reduction be made in the capital of the Company to bring it into correspondence with probable future earnings.

Patents.

The Committee find that unnecessarily large sums of money have been spent in legal warfare.

The Committee recommend that this costly litigation should be concluded as speedily as possible, and the position of the Company maintained and extended by a vigorous commercial policy.

Commercial Policy.

The Committee find that the recent reduction in prices is a step in the right direction, and that under careful management the cost of distribution should be materially reduced.

The Committee recommend that the reduction in selling prices should be carried still further, as the most effectual method of developing the business of the Company and of checking competition and infringement. They also recommend the closer association of the Company with the large gas companies, and a revision of the present selling arrangements.

Management.

The Committee find that the present management is inefficient, and that in many cases the duties of officials overlap.

The Committee recommend that a new Manager of wide experience and administrative capacity be appointed, and that the whole staff be reorganized.

Company's Interest in other Enterprises.

The Committee find that the funds of the Company were wastefully applied in the purchase of the Kern burner patents; that virtually no value was received in respect of the purchase of the Sunlight Company and the Chalmers anti-vibrator, and that the interests of the Welsbach Company in other enterprises do not represent adequate value.

The Committee recommend that in future these enterprises be kept separate from the general working of the Company, and be gradually realized as favourable opportunities occur.

Administration and Selling Expenses.

The Committee find that these expenses are unnecessarily heavy, and out of all proportion to the amount of the gross trading profits.

The Committee recommend considerable reductions, and are prepared to submit recommendations on the subject to a new Board of Directors when appointed.

Board of Management.

The Committee find that, in view of past dissensions and errors, the

present Board are incapable of conducting the affairs of the Company with success.

The Committee recommend that all the members of the present Board be called upon to retire, and that a new Board of not more than five members, of large commercial and financial experience, be appointed.

FUTURE PROSPECTS.

51.—The Committee are conscious that the shareholders would naturally be anxious to receive a more precise forecast of the possibilities of the future; but they do not think that it would be wise for them to do more in this particular than to state that, after their prolonged and exhaustive inquiry, they have formed the deliberate judgment that the affairs of the Welsbach Company, if conducted on thorough business principles, and under really efficient direction, are capable of great development, and that there is solid reason to believe that, under different auspices and with a sufficiently reduced capital, the Company should emerge from its present difficulties, and look forward with some confidence to a prosperous future.

ACKNOWLEDGMENTS.

52.—The Committee wish to express their appreciation of the trouble taken, and the time devoted, by the various gentlemen representing the wholesale and retail trade and other interests, who have kindly assisted them in their investigations, and have given valuable evidence and information.

53.—The Committee also desire to acknowledge the facilities which have been afforded to them by the Directors, and the past and present officials of the Company, for the purposes of this inquiry, and to record their high appreciation of the ability and industry of their Secretary and Accountant, Mr. W. W. Wright, and of the valuable service of their Solicitor, Mr. W. Capel Slaughter.

(Signed)

PHILIP STANHOPE. GEORGE A. TOUCH.
THOMAS J. BARRATT. WILLIAM WHITELEY.
FRANK S. RUSSELL. E. WILLIAMSON.

END OF THE MERTHYR GAS STRIKE.

Eight-Hour Shifts Granted.

In the last number of the "JOURNAL," we briefly recorded the occurrence of a strike at the works of the Merthyr Tydfil Gas Company, on the refusal of the demand of the stokers for an eight-hour shift. With the assistance of a number of "free labour" hands, operations at the works were carried on without interruption; but, as might be expected, their work was less productive than that of the skilled hands whose places they had taken. The result was that the stock of gas in the holders was gradually drawn upon; and, with the view of economizing that which was available, it was deemed undesirable to light the public lamps. In the central streets, the gaslights in the busiest of the shops and the electric lights combined furnished some illumination; but elsewhere the general appearance of the place was gloomy. Under these circumstances, the Company's Manager (Mr. J. E. Kenshole), expressed a desire to see the stokers on Saturday the 14th inst.; but he was referred to their district agent, Mr. Victor Morgan, of the Gas Workers' Union, Swansea, whom at first he declined to meet—intimating that he was agreeable to arrange for an eight-hour shift. Upon eventually treating with Mr. Morgan, however, the latter informed him that, if the demand for eight hours were conceded, he would guarantee that the stokers should return forthwith to their work. The men were indisposed at first to accept a stipulation by Mr. Kenshole that the new arrangement should not come into force until January; but Mr. Morgan, in the course of the negotiations, waived this objection on the part of the stokers, in consideration of the Company requiring a little time in which to make the necessary alterations in their arrangements, in view of the adoption of the new system, and a definite settlement of the dispute was arrived at. A memorandum thereof was given by the Manager in the following terms: "I hereby agree, on behalf of the Merthyr Tydfil Gas Company, to sanction the introduction of the eight-hour shift to the stokers of the Company. Will grant them double pay for Christmas, 1901, and double pay for New Year's Day, 1902. After those dates, these privileges, with the usual week's holiday in the summer will be discontinued. The men are not to leave their work during working hours." We understand that the continuance of the privileges which were granted under the old system of twelve-hour shifts was not demanded by the stokers; their only contention being for the introduction of eight-hour shifts. In consequence of the agreement, the stokers at once went back to work.

Fire at a Railway Company's Gas-Works.—Last Wednesday evening a fire broke out in one of the retort-houses connected with the gas-works at the old Docks Station at Birkenhead, where the Wirral Railway Company manufacture gas for their own use. The woodwork of the building was soon in flames; and when the brigade arrived, they found that the tar-tanks were alight. There was a splendid supply of water from the hydrant in the station; and within an hour the outbreak was quelled—fortunately before the fire had reached the gas which was stored there.

Gas Profits and Water Losses.—In an article on the water supply of Llanelly which appears elsewhere, reference is made to the charge for water for trade purposes—1d. to 1½d. per 1000 gallons—which is lower than the rate in any other town in the kingdom, while the domestic rate is quite as high as is generally charged. It appears that the water undertaking of the District Council results in a deficiency which has to be made up out of the rates. At Barry also the water supply is carried on by the District Council at a loss; but this is set right out of the gas profits. The Auditor of the Local Government Board, however, has declared this practice to be improper.

GREENOCK GAS AFFAIRS.

The Unemployed Stoking Machinery.

Bailie Campbell, Convener of the Gas Committee of the Greenock Corporation, submitted the Committee's minutes to a meeting of the Town Council held last Tuesday, and moved their adoption. He said that it must be gratifying to observe that the make of gas in the month of October, as compared with the corresponding month of 1890, showed an increase of 845,000 cubic feet. This increase had been realized with a smaller consumption of coals, and with 22 fewer workmen. The wages bill was also £57 less. Reference was made by the Manager (Mr. Ewing) to the fact that the stoking machinery was not in operation during that month. It appeared that he was satisfied that he could secure more economical results by hand labour in the meantime than by the use of mechanical apparatus. In connection with this matter, a Committee had been appointed to confer with the Contractors for the machinery, and to request them to give the Manager the benefit of their experience and assistance as to its proper utilization. The Manager's report for November also recorded an increase in the quantity of gas made—namely, 1,167,300 cubic feet—with less coal used. The wages bill was lower by £176 than in the corresponding month of last year. Taking the two months together, it would be found that the net increase in the make of gas was upwards of 2 million cubic feet, that 196 tons of coal less had been used than in the corresponding two months of the previous year, and that there had been a saving of £233 in the wages bill, all of which must be regarded as satisfactory. From the 1st of July to the 30th of November—a period of five months—the increased output represented 3,129,500 cubic feet over the same period of last year, which was a fairly satisfactory advance. Of course, it was but just to acknowledge that the increase was not more than what had taken place in similar periods in some former years. It would be seen from the minutes that Mr. Bailey referred to the propriety of obtaining periodical trial balances of the gas undertaking; and it had been agreed that a trial balance should be arranged for the period from June 30 to December 31, 1901. Mr. Morrison, in seconding the motion, said that he was pleased to see an increased output of gas with a lessened consumption of coal, but his pleasure was modified by the fact that the gas was not of the same quality. He was not complaining of the reduction, if it was only what appeared in the report—viz., from 25 to 23¾ candles; and he said that when Greenock gas was compared with that of many other places, the average of 23¾ candles was good. Bailie Baxter referred to the singular fact that they had such a large increase in the quantity of gas produced with less coal used than on any former occasion. If it was possible to do this now, why had it not been done before? As to the machinery lying idle, he thought that information should have been obtained from the Contractors before the machinery was purchased. After expending £10,000, it was certainly a singular proceeding to ask the Contractors to come and give the Manager instructions as to how it should be worked. After some further remarks, a division was taken, and there were 9 votes for the motion, and an equal number for an amendment, moved by the Dean of Guild—"That the Manager be asked to report forthwith on the best method of utilizing the works as they are at present, and the cost thereof." The Chairman gave his casting vote for the amendment.

GOOLE GAS AND WATER FINANCES.

Local Government Board Inquiry.

An inquiry on behalf of the Local Government Board was held by Colonel Hepper and Mr. Burd at Goole last Tuesday, relative to an application of the Urban District Council to borrow a sum of nearly £19,000 for gas and water purposes. It was stated that part of the proposed loan was required to repay money spent upon extensions of the gas-works after they were purchased by the Council in 1894; the total outlay being £25,000. Other extensions and renewals had since taken place; and it was now desired to buy land for further extensions, at the price of £2700. The gross profits for the past seven years had been £9013, and this had been spent in paying for some of the work named. Other items had been paid for out of revenue, though they were really capital expenditure. The revenue account had been overdrawn by £11,478; and the purpose of the proposed loan was to repay this. Colonel Hepper asked why the application for the loan was not made before; and it was replied that, as the Council were doing the work piecemeal, it was thought better to wait till it was completed. The method adopted was to borrow money from the Treasurer; and this went on until the Local Government Board surcharged the Council. Ultimately, however, on appeal, they remitted the surcharge. From £10,000 to £12,000 of the amount of the loan was already allocated, because they had spent this sum out of a loan of £15,000 which they had obtained for another matter. The Inspectors (who both commented strongly on the bad finance of the Council in expending money before they had obtained loans) announced that they would examine the books and the gas-works; and the inquiry closed.

The Dellwik-Fleischer Water-Gas System.—We learn that the Directors of the Ilford Gas Company, after inspecting the installation of the Dellwik-Fleischer water-gas plant at the West Bromwich Gas-Works, and examining into the results there obtained, have decided to adopt this process in preference to the ordinary type of plant for the manufacture of carburetted water gas. The plant will have a capacity of 500,000 cubic feet per day, and will be erected by Messrs. R. & J. Dempster, Limited, of Manchester. The water gas will be mixed with the coal gas in the foul main, and the mixture enriched with benzol in the manner adopted at West Bromwich and at the Continental installations of this plant. The Dellwik-Fleischer Water-Gas Syndicate have recently obtained an order for plant of a daily capacity of about 800,000 cubic feet for the town of Gijon, in Spain. At this place the gas will be used for admixture with coal gas, and also for driving gas-engines of 250-horse power to furnish electric power for the tramways

ELECTRIC LIGHTING NOTES.

On Saturday, the 14th inst., the electricity supply works which have been erected at Sutton Coldfield by the Corporation, at a cost of £26,000, were formally opened by Mrs. Seal, wife of Alderman Seal, Chairman of the Electric Lighting Committee of the Corporation. Later in the day, the Mayoress (Mrs. Glover) switched on the current to the arc lamps in the main streets.

A fortnight ago, mention was made in the "JOURNAL" of the fact that the Hull City Council had approved a proposal of the Electric Lighting Committee to supply current to a certain firm for power purposes at 1d. per unit, providing 500,000 units a year were used. The firm referred to were Earle's Shipbuilding Company; and the agreement come to is that they shall take a supply of electricity from the Corporation for three years, the charges to be as follows: Exceeding 300,000 and under 750,000 units in the three years, 1½d. per unit; over 750,000 and under 1,500,000 units, 1¼d. per unit; and exceeding 1,500,000 units, 1d. per unit. The Engineer reported that to carry out this supply they would require four transformers, at an outlay of £2780, the cost of the mains would be £6000, and in all an expenditure of £9202 would be necessary. The Chairman said the Company would require the current in about two months. The Committee agreed to the outlay.

In the course of the Local Government Board inquiry into the application of the Erith Urban District Council for a loan to enable them to carry out an electric lighting scheme, evidence was given by Mr. W. K. Marriott, the Chairman of the Electric Lighting Committee of the Barking Urban District Council, as to the "free-wiring" system adopted there. He said that the working classes in Barking took up electric light largely. The landlords wired the houses, and some also got the work done by the Free-Wiring Company, by which the tenant was charged 1d. per unit more than the registered price of the electricity. This 1d. was the profit of the Free-Wiring Company; and the payment was made through the Urban District Council to the Company. The Council at Barking supplied penny-in-the-slot meters; and these had been very well taken up. The tariff rate was 4½d.; and they charged the tenant 5d.—½d. being for the cost of the meter. Where the wiring was done by the Free-Wiring Company, this brought the cost up to 6d. per unit. They had 50 slot meters at present; and the previous month these yielded £16. He estimated that, on the average, the workmen took current to the extent of from 1s. 6d. to 2s. a month; and for this sum they had four lamps. This statement was gone into at the inquiry, and found to allow a light for 42 minutes for each lamp per night.

The controversy between Alderman Smallman and Mr. J. Cecil Bell, as to the alleged "breach of faith" by the City of London Electric Lighting Company, Limited, to which reference was made in our "Notes" last Tuesday, has been continued. It is unnecessary, however, to follow up the dispute at any length here. In Alderman Smallman's reply to Mr. Bell, he says the Directors of the Company evidently intended to retain in their hands a weapon wherewith, in the future, they might harass the Corporation, and possibly bring about further litigation; and, in these circumstances, the Electric Lighting Committee were in honour bound to forthwith report the facts to the Court of Common Council, and recommend the discharge of the reference to them. To this Mr. Bell replies by repeating his previous statement that the basis of all negotiation between his Company and the Committee was that all litigation pending should be dropped, and each side should pay its own costs. This, of course, left each party in possession of the point it had gained up to the present. He adds that "it would be as reasonable to suggest that the abandonment of all litigation involved the reinstatement of the contracts for the western and central districts of the City, which have been declared by the Court of Appeal to be invalid, as that it meant the abandonment by the City Company of that for the eastern district, which the Court of Appeal has declared to be valid." There the matter rests.

Last Thursday, the works for the supply of electricity to Maidstone were formally inaugurated by the switching on of the current by Mrs. Vaughan, wife of Mr. Edmund Vaughan, the Deputy-Mayor and Chairman of the Electric Lighting Committee. The question of the installation of the electric light was first seriously discussed last year; and it was ultimately decided to adopt the scheme of Messrs. Stevens and Barker, in conjunction with one prepared by the Borough Surveyor (Mr. T. F. Bunting) for a dust destructor—subsequently abandoned. The Fair Meadow was the site chosen for the station; and work was commenced on the 21st of December—as nearly as possible a year ago. Four of Messrs. Davey, Paxman, and Co.'s multitubular boilers, each with an evaporating capacity of 6000 lbs. of water per hour at a working pressure of 160 lbs. per square inch, constitute the steam-generating plant. There are five steam dynamos—four 150-kilowatt, capable of developing 240 indicated horse power at normal load and 280 at overload, at 375 revolutions per minute, and one 75-kilowatt, capable of developing 120 indicated horse power at normal load and 168 at overload, at 420 revolutions per minute. The switchboard, fixed in the centre of the north wall of the engine-room, is raised from the floor, and approached by steps. The accumulator, consisting of 280 chloride cells, is capable of discharging 100 amperes for five hours, or 300 amperes for one hour; the latter would supply upwards of 4000 8-candle power lamps without aid from the dynamos. The distribution of electrical energy is on the three-wire continuous-current system. Disconnecting and fuse boxes are placed at various points in the distributors, for the purposes of testing and isolating. Mains have been laid for a total length of upwards of five miles.

Incandescent Gas Lighting at Holywell.—Incandescent gas lighting has given general satisfaction at Holywell. At the beginning of last winter, the British Gaslight Company, Limited, were asked to fix 50 additional burners in the public lamps; bringing the total up to 98. The Company's Manager (Mr. H. B. Chamberlain, jun.) has now recommended the Council to have the burner fitted in new lanterns; and Greene's "St. Alban's" lanterns were selected. The Council proposes to extend the system to all the lamps before next winter.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1658.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 13	6⅓	Bombay, Ltd. . . .	6⅛—6⅜	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4⅛—4⅜	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	..	4 8 11
270,000	,,	,,	9	Do. New	192—197	..	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	..	3 14 1
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb. .	112—115*	..	3 9 7
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	212—217	—10	4 12 2
246,320	,,	,,	7	Do. A. Ord. Stk. .	150—155	..	4 10 4
1,047,500	Stk.	Aug. 28	5	Bristol, 5 p.c. max. .	118—120	..	4 3 4
420,000	20	Sept. 27	10	British.	41—42	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . .	19—21	..	4 5 8
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	9⅛—9⅜	..	6 3 1
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	90—98	..	4 1 8
150,000	20	July 17	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept 27	10	Cape Town & Dis., Ltd.	14⅜—15½	..	6 9 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	267—272	—6	4 8 3
236,425	,,	,,	9	Do. New do. .	203—208	..	4 6 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135*	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	162—167*	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165*	..	4 4 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—.28	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4⅛	Gas- light and Coke	4 p.c. Ord. . .	97—99	+2	4 8 10
2,600,000	,,	,,	3½		3½ p.c. max.	88—90	..	3 17 9
2,799,735	,,	,,	4		4 p.c. Con. Pref.	112—115	..	3 9 7
4,063,425	,,	Dec. 13	3		3 p.c. Con. Deb.	90—92*	..	3 5 3
70,000	10	Nov. 13	8	Hongkong & China, Ltd.		13—14	..	5 14 4
3,800,000	Stk.	Nov. 13	10	Imperial Continental .		208—213	..	4 13 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.		100—102	..	3 8 8
561,000	Stk.	Aug. 29	10	Liverpool United A		232—234	..	4 5 6
718,100	,,	,,	7	Do. do. B		170—172	..	4 1 5
306,083	,,	June 28	4	Do. do. Deb. Stk.		119—120	..	3 6 8
75,000	5	Dec. 13	4	Malta & Medn., Ltd. .		4½—5*	..	4 0 0
560,000	100	Oct. 1	5	Met. of	5 p.c. Deb.	105—108	..	4 12 7
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 13	3⅜	Monte Video, Ltd. . .		9—10	..	7 0 0
717,946	Stk.	Aug. 3	8½	Newc'tle & G'tesh'd Con.		214—216	..	3 18 8
312,855	Stk.	June 28	3½	Do. 3½ p.c. Deb.		100—102	..	3 8 8
150,000	5	Nov. 28	8	Oriental, Ltd. . . .		7⅛—8	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.		6⅞—7⅛	..	4 19 4
15,000	5	,,	8	Do. do. 1879, £1 pd.		1⅛—1⅜	..	4 11 5

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Sept. 27	7	Ottoman, Ltd. . . .	5⅝—5¾	..	5 12 0
851,070	10	Oct. 11	7	River Plate Ord. . .	10—10½	..	6 13 4
250,000	Stk.	June 28	4	Do. 4 p.c. Deb..	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.. . .	11—12	..	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	240—242	+1	4 2 6
523,498	,,	,,	10	Do. C	240—242	+1	4 2 6
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	123—125	..	4 0 0
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	102—106	..	4 14 4
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton	A. 5 p.c.	122—127	..	4 6 8
250,520	,,	,,	4		B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .		7½—8½	..	5 17 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .		9½—10½	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .		12⅝—13½	..	4 8 11
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.		107—112	..	3 11 5
				WATER COMPANIES.			
780,599	Stk.	June 28	11½†	Chelsea, Ord. . . .		320—330	..	3 9 8
150,000	,,	,,	5	Do. 5 p.c. Pref. .		152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75		140—145	..	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb. .		140—145	..	3 2 1
1,720,560	Stk.	Oct. 11	7	East London, Ord.. .		200—205	..	3 8 4
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .		140—145*	..	3 2 1
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .		95—97*	..	3 1 10
700,000	50	Dec. 13	8	Grand Junction	10 p.c. max..	113—116*	..	3 9 0
310,000	Stk.	Sept. 27	4		4 p.c. Deb..	122—126	..	3 3 6
708,000	Stk.	Aug. 15	14	Kent		300—305	..	4 11 10
160,000	,,	,,	7	Do. New, 7 p.c. max..		200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max..		298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p.c. max..		218—223	+1	3 11 9
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb..		125—130	..	3 1 7
500,000	100	Aug. 15	12⅛	New River, New Shares		395—405	..	3 3 2
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb..		125—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and	Ord. . . .	193—198*	—2	3 10 8
126,500	100	,,	7		7½ p.c. max.	182—187*	..	3 14 10
489,200	Stk.	,,	5		5 p.c. Pref..	150—155*	..	3 4 6
1,019,585	,,	Oct. 11	4	Vauxhall	4 p.c. A Deb.	124—129	..	3 2 0
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .		280—290*	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .		137—142*	..	3 3 5
200,000	,,	Sept 12	3	Do. 3 p.c. Deb. .		94—97	..	3 1 10

* Ex div.

† Next dividend will be at this rate,

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Office, Commercial Road, S.W.—Mr. F. S. CLAYTON (the Governor) in the chair.

The SECRETARY (Mr. G. H. Gill) read the notice calling the meeting, and subsequently the report of the Company's Auditors and the certificate of the Government Auditor. The former expressed their entire satisfaction with the clear and precise way in which the accounts had been kept, the more so taking into consideration the continuous increase of the work in the Accountant's department.

The GOVERNOR, in moving the adoption of the Directors' report, said the gross income for the half year ended Sept. 30 last had been £91,452, or £2331 in excess of that of the corresponding period of last year. There had been an increase of £2807 in the working expenses, caused chiefly by increased rates and the high price of coal; the coal supplied under the new and more favourable contract having been in use for only about six weeks of the half year. Moreover, the first payment, amounting to £1957, had been made to the Chamberlain of London for the sinking fund. Although, however, the Company had been handicapped with these heavy expenses, the balance of undivided profits—the sum applicable to dividend—was sufficient to justify the Directors in recommending a dividend at the increased rate of 11½ per cent. per annum on the present occasion. After paying this, £40,132 would remain in reserve. He ventured to believe that the proprietors would consider that this was a satisfactory state of things; and the Directors congratulated them upon it. During the half year the expenditure on capital account had been £8755, made up of £5098, the final payment on the contract for constructing the new service reservoirs at Putney Heath; £2944, the balance on the contract for raising the banks of the subsidence reservoirs at West Molesey; and £713 expended on extensions of mains, &c., in the district. The quantity of water pumped during the half year was 2547 million gallons; being an increase of 85 million gallons as compared with the corresponding period of 1900. There had been 412 new supplies laid on in the six months, estimated to produce an additional water-rental of £1290; while 138 houses had been pulled down for improvements, representing a temporary loss of income of £220. During the past half year, 1404 yards of service-mains had been laid to meet extensions in the district. In August last, the Local Government Board issued an order on the Company for the construction of the latter's portion of the intercommunication works under the Metropolis Water Act, 1899; and a contract for the work had been entered into with Messrs. J. Aird and Sons. The line of main which they would have to lay under this contract extended from Caledonia Street, Grosvenor Road, Pimlico, to the boundary of the West Middlesex Company's district in the Brompton Road. Ultimately it would be necessary for them to issue about £21,000, the cost of these works, in debenture stock, under the provisions of the Act of 1899; and he might mention that debenture stock raised under that Act was exempt from the sinking fund clauses, and that the dividend upon any debenture stock created under it was payable by all the Metropolitan Water Companies in proportion to their water-rentals. His Majesty's Government had given notice of their intention to introduce a Bill in the coming session having for its object the formation of a Water Board for the purchase, by agreement or arbitration, of the undertakings of the Companies. They were at a disadvantage with regard to this Bill, as they would not have its full text before them until after Mr. Long had introduced it into the House of Commons. The right hon. gentleman had stated publicly that the Companies would be dealt with fairly and equitably; but judging by the "Gazette" notice, the terms of the measure would seem to differ but little from those of the Water Bills of the London County Council, except as regarded the composition of the Water Board. He supposed that the notice must not be taken too seriously, and that they must wait patiently until they saw the Bill itself; indulging meantime in the hope that Mr. Long would fulfil the promise he had publicly given. The Companies would be heard before the matter was settled. When the Bill was read a second time, it would be referred to a Committee, before whom Counsel would appear on behalf of the Companies, to protect whose interests the proprietors might rely upon it that the Board would do their utmost. It was unnecessary to say that the London County Council had given notice of their intention to re-introduce their Purchase Bill. It could have no chance of success; but he supposed that that body had full faith in the old adage that "Everything comes to him who waits." He, however, thought the Council would be disappointed in their expectation. The Governor afterwards expressed great regret at the death of Colonel Sir Wilford Brett, who had been a Director of the Company for about thirty years, while members of their deceased colleague's family had been represented on the Board from the early part of last century. Mr. Herbert Peter Bodkin had been appointed to fill the vacant seat for the remainder of Sir Wilford Brett's term of office. The proprietors could not but feel that the undertaking was in a sound and prosperous condition. The Directors were very much indebted to the able Secretary for his assistance; and the Engineer (Mr. Albert Gill) gave the Board entire satisfaction. The Company were fortunate in having such an able staff.

The DEPUTY-GOVERNOR (Mr. Jackson Hunt) seconded the motion.

Mr. J. DREW asked a few questions respecting the contribution to the Chamberlain's fund, and remarked that he did not quite understand how the proprietors would benefit by the payment to which the Governor had referred. He regarded the Government purchase scheme as a very serious matter, respecting which it would be highly necessary for the Directors to watch the proceedings carefully. He was quite satisfied that if the water consumers expected to get any benefit—any reduction in price—by the acquisition of the Companies' undertakings, they would be very much mistaken.

The GOVERNOR, in reply, stated, with reference to the sinking fund, that it was a case of "Hobson's choice." Parliament now introduced the sinking-fund clauses into every Bill which the Water Companies promoted for the purpose of raising additional capital. The amount

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GREAT-BRIDGE.
STAFFORDSHIRE.
TUBES
AND FITTINGS
GAS, STEAM, WATER GALVANIZED-TUBES, &c.
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of the fund was, unfortunately, not any advantage to the Companies—quite the contrary. It remained *in medio* in the hands of the City Chamberlain; and what would become of it in case the undertakings were purchased, remained to be seen when the text of Mr. Long's Bill was before them. Probably it would be handed over to the Water Board, but the Companies *quâ* Companies would receive no benefit.

Mr. DREW remarked that it represented undivided profits.

The SECRETARY: In addition to the interest.

The GOVERNOR: We should say so; but the Act of Parliament differs from that opinion, and says otherwise. Continuing, he said that the Company raised £50,000 of stock, and they had to pay practically £2000 a year in respect of this amount to the Chamberlain.

The GOVERNOR: It was about 4 per cent.; while in the ordinary way the Company would have raised debenture stock at 3 or 3½ per cent. The money they now paid to the Chamberlain would then have gone into their own pockets. Everything the Company raised under any future Act of Parliament would cost at the rate of 7 or 8 per cent. As he had said, they must hope that the Companies would be dealt with fairly in the Government Bill, as Mr. Long had publicly promised. He was himself rather inclined to believe that, in a great degree, the "Gazette" notice was a matter of form, and that when the text of the Bill was before them, the measure would be found to be framed on more favourable terms than the notice would lead them to expect. If the Bill should contain a clause enabling the Companies to arbitrate on the terms of the Lands Clauses Act, they would be dealt with fairly and equitably, and this would include the 10 per cent. for compulsory purchase. This 10 per cent. was, however, allowed by a sort of unwritten law; there was nothing in the Act of Parliament about it.

The motion was then put and carried unanimously; and resolutions were afterwards passed declaring the dividends recommended, and electing Mr. C. Stone-Wigg to fill the vacancy in the auditorship caused by the resignation of Mr. H. P. Bodkin.

A vote of thanks to the Governor, the Deputy-Governor, the Directors, and the staff closed the proceedings.

The Alleged "Wait-a-Bit" Policy of Trade Unions.—Mr. R. Bell, M.P., when addressing a public meeting at Wellington (Salop.) recently, took advantage of the opportunity to reply at length to the attacks that have lately been made, in "The Times" and elsewhere, on Trade Unionism. He characterized as a deliberate lie the statement that the members of Trade Unions were largely skulks. He did not say that all Trade Unionists in the country were as active and energetic as they ought to be. But whenever the attention of the leaders of Unions was drawn to cases of laziness, action was taken; and time after time they had expelled members because of chronic laziness. It was unjust for "The Times" to argue that Trade Unionism handicapped skilled workmen. They certainly endeavoured to fix a minimum wage for a particular class of work; but they did not say that employers should not pay more than the minimum wage.

LLANELLY WATER SUPPLY.

The Llanelly Urban District Council are the possessors—we cannot go so far as to say the "happy" possessors—of the water-works supplying their district; and they have recently been made painfully conscious of the fact that the water they furnish is not quite what it should be. Its weak point is quality, not quantity. Early last year, the domestic consumption—that is, exclusive of works—was something like 60 gallons per head per day; and owing to the capacity of the reservoir having, through an accident, been reduced, the Borough Surveyor (Mr. G. Watkeys) had to issue notices to the consumers that he had been specially instructed to take proceedings against all persons who allowed water to run to waste. He pointed out that if the quantity used could be reduced to 30 gallons per head, which was more than sufficient, the chances of the works in the district being closed for want of water would be greatly obviated. This reduction would effect a saving of 750,000 gallons daily, or more than half the quantity of water used for trade purposes, and reckoned at 2d. per 1000 gallons, would mean £2281 5s. per annum. The excessive consumption, of course, jeopardized the supply to the works, which had to be cut off, owing to scarcity of water, in the previous October. At that time, there was a daily lowering in the level of the reservoir to the extent of about 2 inches. The water, indeed, went down so low that the District Council had to commence the construction of another reservoir higher up the stream.

Coming down to more recent times, it appeared that not long ago the Llanelly Rural District Council (Burry Port, &c.) expressed a desire to purchase water from the Urban District Council; and an agreement was entered into for the supply of 300,000 gallons at 6d. per 1000, against an average trade charge of 1d. to 1½d. at Llanelly. The Local Government Board caused an inquiry into the matter to be held by an Inspector (Mr. E. A. S Fawcett) and a Medical Officer (Dr. J. Reece), whose report caused consternation in the Council at a recent meeting. Some extracts from it were forwarded to the Rural District Council, accompanied by a letter in which the opinion was expressed that the Llanelly Water-Works were far from being a satisfactory source; and that therefore the Board could not entertain the question of sanctioning the proposed supply therefrom to Burry Port, "unless provision was made for the efficient filtration of the water before its delivery to the consumers." Subject to this provision being made, the Board would be prepared to consider an application for their sanction to a loan to defray the cost of the works of distribution, &c., to the extent of directing a local public inquiry to be held into the matter.

In their report, the Inspectors dealt first with the large reservoir (the Cwmlliedi) and then with the small one (the Trebeddod). With regard to the former, they stated that it has a capacity of 220 million gallons, and is fed from a gathering-ground of 4048 acres, having upon it 38 farmhouses and 55 cottages. There is no sewerage system within the area, so that polluting matter is not removed from the ground, and

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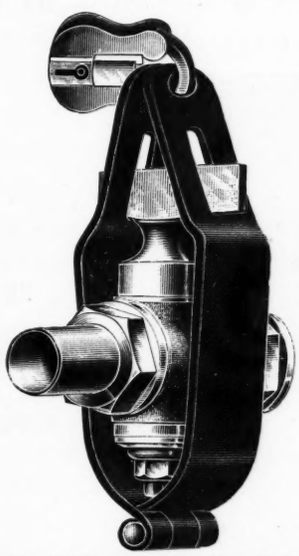
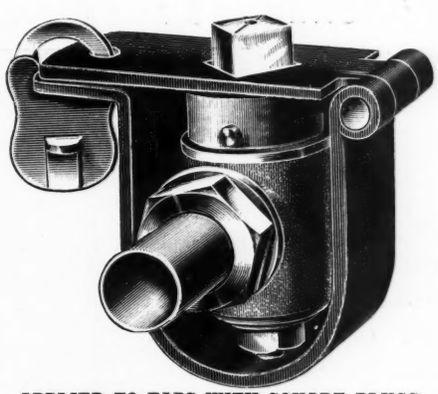


APPLIED TO TAPS WITH THUMB PLUGS.



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has little chance of being purified before reaching the streams. There is no bye-wash, and therefore the whole of the water flows off the gathering-ground into the reservoir, which is being gradually filled with solid matter. The Surveyor has prepared plans for a bye-wash; but as it would cost £26,000, the idea has not been entertained. The night before the Inspectors visited the reservoir, the water running into it from the Lliedi stream was "extremely dirty," and "looked like pea-soup;" while all the other streams were more or less discoloured. There was "a thick scum," containing all kinds of *débris*, at the north end of the reservoir; the discoloration extending down to the valve-tower at the south end, where the water is drawn off into the mains supplying the district. The Council are now constructing a new impounding reservoir, to hold 200 million gallons, at a short distance above the existing one; and the water will not be admitted to it when the streams are discoloured. The water in the present reservoir will only be used when the new one cannot meet the demand; and none will be drawn off after rain until it has been in the reservoir sufficiently long to clear by sedimentation. The Trebeddod reservoir has a capacity of 8 million gallons and a gathering-ground of 350 acres, upon which there are seven farmhouses and a cottage. Here there is a bye-wash, and consequently the water was found to be very much clearer than that in the Cwmlliedi reservoir. The water is passed into the mains without filtration or treatment of any kind. The Inspectors expressed the opinion that the water should be filtered before being distributed for domestic use, and thought the cost might be defrayed by increasing the charges for trade supplies.

After the contents of the report had been made known by the Clerk to the Council, the Chairman (Mr. J. Williams) remarked that it was unfortunate that the Inspectors should have visited the reservoirs just after heavy rain. They had made a sweeping report; but the important point was that the Local Government Board would not sanction the supply of Llanelly water to Burry Port until it had been filtered. He did not think the few farms and cottages were the cause of such pollution as had been found; and a suggestion made that the Council should purchase the farms could not be entertained. He looked forward to a great improvement after the completion of the new reservoir. Mr. Trubshaw said it was only in times of flood that the water was polluted. He was not at all alarmed at the report, because he believed Llanelly water could be compared with any in the kingdom. Mr. J. A. Williams thought the Inspectors should have analyzed the water. If they had done so, they would, he said, have found it of proper quality. The Surveyor said he did not consider there was any necessity for filtration. Dr. S. J. Roderick remarked that he had never been able to attribute any illness to the water, except on one occasion when the water was very low. He expressed the opinion that when they had the new supply it could be favourably compared with any other. The Surveyor pointed out that the Medical Officer of Health for the Rural District Council (Dr. Evans) was in favour of Llanelly water for Burry Port. Mr. Wilkins suggested that they should invite both Inspectors to again visit the place and make a joint report; and this was unanimously agreed to.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Kilmarnock Corporation Gas-Works have been getting, to use a somewhat peculiar phrase, increasingly small for the consumption of gas in the district. A site for new works has been resolved upon; and at a meeting of the Corporation this week, the Gas Committee stated that they had been considering a report by the Manager (Mr. W. Fairweather) with plans for the new works. In one of these, it is proposed to appropriate the whole of the ground (about 15 acres), and the other shows an arrangement of the works in such a way that only 12 acres will be occupied. The Committee recommended the first scheme. They also recommended that the Town Clerk be instructed to serve the necessary notice as to acquiring the ground. Bailie Robertson said he was sorry that he could not agree to the recommendations. He thought the ground which it was proposed to acquire was far more than was necessary or reasonable. The present works occupied only 3 acres; and their productive capacity was something like ¾ million cubic feet of gas per day. If they laid down plant to manufacture 5 million cubic feet per day, this would be nearly eight times more gas than they were at present supplying, and, to his mind, it was far beyond what was ever likely to be required for Kilmarnock. He moved that the recommendations be not adopted. Bailie Finlay seconded, on the ground that there was every probability of electric lighting being introduced into the town, and that it was not likely to be accompanied by an increase in the quantity of gas consumed there, whatever might be its effect in large cities. Mr. R. Muir, in support of the Committee's recommendations, said that their present works were in a very congested condition, and were badly situated. They stood on a high level; and a great deal of force was required to send the gas into the town. He had no doubt that in ten years the ground proposed would be required. Mr. Wilson said that in 1871, when the present works were erected, the annual manufacture of gas was only 30 million cubic feet; whereas it was now 150 million cubic feet. The recommendations of the Committee were adopted by 20 votes to 3. The site which it is proposed to use is known as the Holm Quarry.

The new gas-works at Perth are already in operation to their full capacity. Mr. W. B. M'Lusky, the Manager, has just reported to the Town Council that all the ovens in the first installation are in action; and, as they have not a single retort to fall back upon, he urges that the erection of a second batch of retorts should be proceeded with early next year, in order that at least a section of it may be ready for work the following winter. The Council have resolved to put up to auction the feuing of the site of the old gas-works in Scott Street, at the rate of 30s. per pole. In the event of its not being taken up at a substantial price, it is understood that the Council are not to feu the ground, but are to consider its suitability for the erection of workmen's houses—a question which is being agitated at present in Perth.

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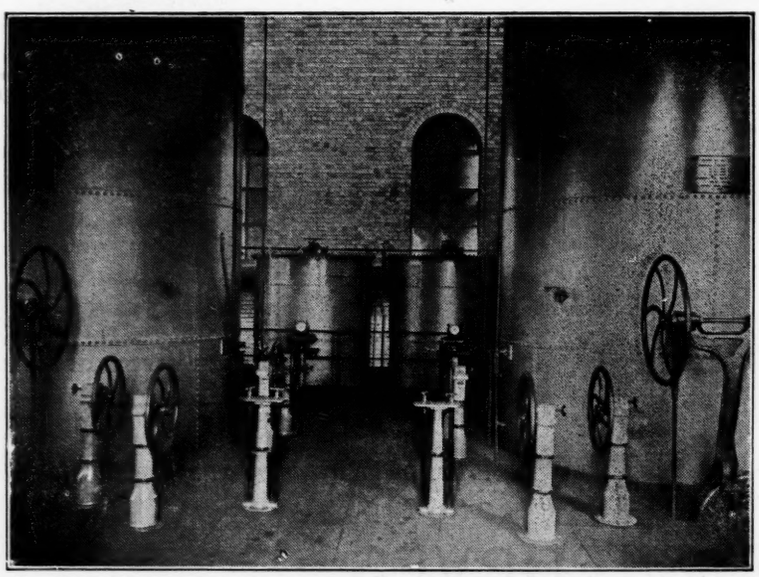

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One-Fifth Section of Birmingham Plant, Windsor Street Station.

The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 12 MILLION CUBIC FEET.

The Town Council of Broughty Ferry this week instructed Mr. Forbes Waddell, their Manager, to prepare plans for a new retort-house and coal-store for the gas-works; it being found that the existing works are being fully taxed by the demand for gas, which is continually growing.

The question of the introduction of the electric light into Broughty Ferry is at present agitating the ratepayers. It is understood that last week the Electric Lighting Committee had under consideration the carrying out of the Provisional Order, which expires in July next year; and the opinion was unanimously expressed that an installation should be gone on with at once. Some time ago, the Town Council purchased a property in Dundas Street for the purpose of a site for electrical plant; but there is a division in the Council as to the best site available, and a proposal that ground at the gas-works could be obtained is favoured by a goodly section of their number. The Town Council on Monday remitted to a Committee to submit a short list of electrical experts, from which one will be selected to report upon a suitable site for electricity works.

The Arbroath Gas Corporation are making a change, not only in the managership, but also in the clerkship of the body. In the process of consolidating public offices, it has been found advisable to give the clerkship of the Gas Corporation to the Town Clerk. Mr. David Chapel, Solicitor, has been Clerk to the Gas Corporation for the long period of thirty years. I understand that he has been provided for, on his retirement. In taking farewell of the Corporation this week, he expressed his gratitude for the treatment he had all along received from the members, several of whom paid a high tribute to Mr. Chapel's abilities and his diligence in the performance of his duties.

It seems that when the Arbroath Gas Corporation appointed Mr. A. C. Young, of Kelso, to be their Manager, they expected that Mr. Young would be able to take up his new duties on Jan. 1. He is, of course, unable to do this, and has written to the Corporation stating that he has made arrangements with the Directors of the Kelso Gas Company to visit Arbroath at least twice a week until he is at liberty to go there permanently. The Corporation have agreed to this.

The fortnightly statement of the Edinburgh and District Water Trust shows that the stock of water on the 17th inst. was 1,720,947,000 gallons, which represents an increase, when compared with a fortnight ago, of 74,845,000 gallons. The rainfall at Glencorse is thus stated: Jan. 1 to Dec. 17, 1901, 32·53 inches; the corresponding period of 1900, 47·30 inches; and of 1899, 39·50 inches. At Gladhouse, 1901 (to Dec. 17), 29·82 inches; the corresponding period of 1900, 42·12 inches; and of 1899, 33·46 inches.

We understand that the Westminster City Council have decided to make a trial of the Kitson system of public lighting. The lamps are to be erected at places where there is extensive cross traffic, such as Trafalgar Square, Buckingham Palace Road, Piccadilly Circus, and Leicester Square.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 21.

Sulphate of Ammonia.—The market continues quiet at all points; but buyers have been availing themselves more freely of the larger supplies offered, and values have consequently been about maintained. The closing quotations are £10 15s. per ton f.o.b. Hull, £10 16s. 3d. per ton f.o.b. Liverpool, and £10 17s. 6d. per ton f.o.b. Leith. There has been large direct inquiry for January delivery; but buyers' ideas are for the most part 2s. 6d. per ton below prompt prices, and consequently very little business has resulted. For January-April delivery, London, Beckton terms, is now quoted £11 2s. 6d. per ton, without attracting attention; but Scotch makers have not so far modified their view for delivery ahead.

Nitrate of Soda is steady at 9s. 3d. to 9s. 4½d. per cwt., according to quality, on spot.

LONDON, *Dec.* 21.

Tar Products.—The markets are generally quiet, doubtless owing to the approach of the holidays. Pitch is very firm in London; but the demand for prompt is not so strong as it was a few days ago. This also applies to the North, where one or two parcels are now offering for January-June—makers evidently being anxious to secure the high prices now ruling. In South Wales there is not much inquiry for prompt delivery. Consumers appear to have supplied their immediate wants, and for next year they seem inclined to hold off the market. Of course, several large contracts have already been made, and consumers are not anxious to buy forward at present high prices, unless they can sell fuel, which is difficult. 90 per cent. benzol is very quiet; and there is more offering. There are now sellers at 11d. January-March, but only of limited quantities. Consumers are still willing to pay 9¼d. for 50-90 per cent.; but at the moment there is nothing offering at this price. Creosote remains very steady; and there has been rather an improved inquiry during the past week. It is not yet known at what price one of the largest railway contracts was taken. When this is published, it may have a beneficial effect on the market. Carbolic continues steady, especially for prompt delivery. Business is reported in 60's at 1s. 11d., January-June; while for prompt delivery 1s. 11¼d. has been paid. 50's are selling freely at 1s. 7½d., but only for January delivery. As regards crystals, 34-35's are in very good demand; several orders having lately come into the market from France and Japan. 39-40's are dull of sale. In anthracene, one or two small transactions appear to have taken place, but at very low prices. Consumers will not pay more than 2¼d. per unit over next year, and that only for the very finest quality. Several parcels of "B" have been offering at 1¼d. to 1½d., but without finding buyers. Some small contracts have been placed in tar during the past week at prices varying according to the situation.

The average values obtaining during the week are: Tar, 15s. to 18s. Pitch, east coast, 35s. 6d. to 36s. 6d.; London, 37s. 6d.; west coast, 34s. to 34s. 6d. Benzol, 90's, 11d.; 50's, 9½d. Toluol, 10d.

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Sulphate of Ammonia.—The market is decidedly quiet, with an absence of business. The Gaslight and Coke Company are not offering for December, and are now willing to accept £11 2s. 6d. for January-June. There are, however, sellers on Beckton terms at £10 15s. prompt shipment. In Hull, business has been done at £10 15s. for prompt, evidently to clear out stocks before the holidays. In Leith, there is really no business to report. There are sellers at £10 17s. 6d. But buyers offer only £10 16s. 3d.; and even at this will take only small quantities. The Liverpool market is very quiet; and the demand is not strong for prompt. There does not seem any chance of improvement in this article at present, especially as one or two of the makers are now open to sell for January at prices nearly approaching to those ruling for prompt delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.—An extra pressure of inquiry is being kept up for all descriptions of fuel, but chiefly for deliveries required before the holiday stoppages of the pits; and it is not unlikely that, after the turn of the year, there may be pretty general quietude in the market. For house-fire qualities, prices are strong at full list rates—averaging 15s. to 15s. 6d. per ton at the pit for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house coal. There is, however, no indication of any upward move with the close of the month. One or two Derbyshire collieries have temporarily advanced their pit prices about 6d. per ton; but this will no doubt be taken off as soon as the present pressure of orders subsides. Common round coals are moving away freely—in fact, there is just now a shortness of supplies. Requirements for iron-making, steam, and forge purposes are still only moderate; but for house-fire consumption a pretty brisk inquiry is stirring, and there is also a large demand for shipment, owing to contractors, where they can claim remissions of export duty, being anxious to get through all their deliveries before the close of the year. For inland sales, prices are firm at 9s. to 9s. 6d. per ton; but with a shortness of supplies at the ports, slightly better prices are being obtained, ranging from 10s. 6d. to 11s. per ton delivered at the Garston Docks or the High Level, Liverpool. Engine fuel is maintaining the improved tone noted of late, especially in the better qualities, which are very firm at 7s. to 7s. 6d. per ton at the pit; and contracts for next year are reported to have been secured on something like this basis. Common sorts are still plentiful, but not so much of a drug, and there is less competition from outside districts, with 5s. 6d. to 6s. per ton about average figures at Lancashire collieries. Coke is steady at about 22s. to 24s. per ton for best Lancashire foundry qualities, and 13s. 6d. to 14s. 6d. for best washed furnace coke, at the ovens.

Northern Coal Trade.—There has been of late a very full demand for nearly all classes of coal, and the prices have been higher for several kinds, where delivery could be given before the end of the year, after which time the coal tax comes on the contracted coal that has hitherto been exempt. In steam coals, best Northumbrian kinds are higher; and from 11s. 9d. to 12s. per ton is the f.o.b. quotation for early delivery. Unscreened steams are steady; but steam smalls are rather lower at about 5s. 9d. to 6s. per ton. The collieries are working very fully; and the large output has been freely taken up. In the gas coal trade, the demand is now naturally at its highest, and quantities sent by sea to the great companies of the South have been correspondingly large. The price of best Durham gas coals, for early delivery, is from 12s. to 12s. 6d. per ton f.o.b.; but sales are made on contract at least 2s. 6d. per ton lower than these. The locomotive coal contracts are now being settled for next year, at a fall of about 1s. 6d. per ton on this year's contracts. In the coke trade, the demand is full, and there is firmness in the prices; best coke for export being about 18s. 6d. per ton f.o.b. Blast-furnace coke averages 17s. per ton; and gas coke is in full demand, but also in plentiful supply—the production this week being probably the heaviest in the year. Gas coke is about 13s. per ton f.o.b.

Scotch Coal Trade.—Trade is unchanged; and the prospect is not encouraging to coalowners, there being little manifestation of a disposition to contract forward. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 6d., and splint 11s. to 11s. 6d. The shipments for the week amounted to 169,106 tons—a decrease of 31,199 tons upon the previous week, and of 18,631 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,475,890 tons—a decrease of 1,047,977 tons upon the same period of last year.

Gas Poisoning Fatality in Dundee.—On the morning of Sunday, the 15th inst., a servant girl, 18 years of age, in the house of Mr. T. L. Peters, at 27, Springfield, Dundee, was found by her mistress in bed in a state of unconsciousness. The gas had been imperfectly turned off by her on retiring the previous night. The girl died while efforts to resuscitate her were being made by a medical man. She was from the country, and had only been six months in Dundee.

The Inclined Retorts and Coke-Conveying Plant at Meadow Lane, Leeds.—A deputation of the members of the Gas Committee of the Birmingham Corporation, accompanied by Mr. Henry Hack, visited the Meadow Lane Gas-Works, Leeds, last Tuesday, and inspected the installation of inclined retorts and hot-coke conveyors furnished by Messrs. Graham, Morton, and Co., which has been working there for some considerable time. We learn that the greatest satisfaction was expressed on all sides; and Mr. R. H. Townsley, the Engineer and General Manager, was complimented upon the excellent heats and thorough carbonization of the coal, and the steady working of the coke-conveying plant.

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Southport Gas Supply.—The Southport Town Council last Tuesday appointed a Sub-Committee on Gas Manufacture, to report as to the working of the gas undertaking, and decided that application should be made to the Local Government Board for a Provisional Order to repeal, alter, or amend the Southport Improvement Acts, 1871 and 1876, in respect of (1) the illuminating power of the gas to be supplied for lighting purposes; (2) the method of testing the illuminating power; (3) the maximum price to be charged for such gas; and (4) provision as to supplying gas for other than lighting purposes by agreement.

The Shortage of Gas at Brighouse.—The Brighouse Town Council have naturally been much exercised with regard to the unfortunate occurrence to which allusion was made in last week's "JOURNAL" (p. 1611); and at the meeting of that body on Wednesday, a "heated" discussion took place on the management of the works. The Chairman of the Gas Committee (Mr. G. Healey) said that the failure was caused by an accident at the works. The supply was now adequate; the Rastrick works, which had been idle for some time, having been restarted. Mr. J. Pickersgill, in moving that the minutes of the Committee be referred back, alleged that there was mismanagement at the gas-works, and said that the appointment of a Special Committee, to inquire as to the reason why the results were not better, ought to have appeared on the minutes. The inclined retort system did well at other places; but at Brighouse the yield was said to be 1000 cubic feet per ton of coal less than by the old system at the Rastrick works. Mr. Healey said this was what the Sub-Committee, who had met twice, were trying to find out; and they would present a report in due course. The minutes of the Gas Committee were confirmed.

Sequel to the Taff Vale Strike.—The Amalgamated Society of Railway Servants and its Trustees (Mr. R. Bell, M.P., General Secretary, and Mr. J. Holmes, Organizing Secretary), have been served with a writ, at the instance of the Taff Vale Railway Company, for damages in connection with the strike in August last year. The plaintiffs claim damages for "maliciously and unlawfully conspiring together to molest and injure the plaintiffs in their business, and for maliciously and wrongfully procuring certain of the plaintiffs' servants to break their contracts of service with the plaintiffs, and for maliciously and wrongfully watching and besetting, and causing to be watched and beset, the plaintiffs' works and the approaches thereto, and the places of residence of the workmen employed by the plaintiffs, or proposing to work for the plaintiffs, and divers other places, including the Great Western Railway Station at Cardiff, and for using violence and intimidation towards the plaintiffs and their servants, and for preventing persons from working for the plaintiffs, and otherwise committing violation of the legal rights of the plaintiffs." They also ask for an injunction restraining the defendants, their servants, and agents from repeating any of the above-mentioned acts. This action against the Trade Union is the looked-for sequel of the protracted Taff Vale litigation, which, as our readers are aware, ended a short time ago in the House of Lords. It was decided by their Lordships that a Trade Union is liable for the action of its servants or members, and can be made answerable for such actions in a Court of Law.

The Kitson Light in Portland Place.—In the "JOURNAL" for the 10th inst. (p. 1545) we recorded the decision of the Lighting Committee of the Marylebone Borough Council not to recommend the Council to continue the lamps which had been put up by the Kitson Lighting Company as an experiment, and to call upon the Company to remove them. The residents in Portland Place evidently regard the Kitson lighting as a success; for we understand that some 77 of them—including Lord Roberts, Prince Edward of Saxe-Weimar, Mr. St. John Brodrick, Lord Wenlock, Sir James Blyth, Sir George Lewis, and Sir Arthur Ellis—have signed a petition requesting the Council to retain the lamps.

Water Supply for Jerusalem.—In the "JOURNAL" for the 15th of October we gave some particulars of the scheme which was then in progress for furnishing a supply of water to Jerusalem. The works were satisfactorily completed, and were opened on the 27th ult., the birthday of the Sultan, who issued the *irade* for carrying out the scheme on the 26th anniversary of his accession to the throne. Water now flows copiously through the taps of the twelve fountains within the enclosure of the Haram, or Mosque of Omar (the site of the Temple of Solomon), and also from the fountain erected outside the city walls on the ancient Birket-es-Sultan (the lower Pool of Gihon), situated midway between the railway station and Jaffa Gate.

Swindon Water Supply.—At a recent meeting of the Swindon Town Council, it was reported that the sum of £965 had been expended in well sinking in the chalk hills at Ogbourne, about eight miles from the town, and the Water Committee were sanguine of being able to obtain an ample supply of pure water from that source. It was decided that the services of Mr. W. Whitaker, F.R.S., should be retained for the purpose of examining the site, preparing a report thereon, and giving evidence at the Local Government Board inquiry in connection with the Corporation's application for a Provisional Order to amend the Swindon Water Act, 1894. It was stated that the well at Ogbourne had been tested, and yielded 200,000 gallons in 24 hours. Mr. Whitaker has made a survey of the works, and has come to the conclusion that the results were such as to justify the Corporation in proceeding with the operations.

Local Government Board Inquiry at Stafford.—Major C. E. Norton held an inquiry on behalf of the Local Government Board at Stafford last Wednesday, with respect to an application by the Town Council for sanction to borrow £7000 for the purposes of the gas undertaking. It was stated that the debt on the works at March 31 was £67,725, or about £10,000 less than the purchase price in 1878. The manufacturing, pumping, and storage capacity of the works had been largely increased and almost entirely re-arranged. The distributing system required enlarging, to meet the present demand and the future increase which was certain to be realized, owing to the fact that new manufactories were being established in the town. The works for which the loan was required were: Extension to meter-house, new meter, and extension of offices, £1350; boiler-house and boilers, £2200; governor, mains, services, meters, &c., £3450. At the close of the inquiry, the Inspector visited the gas-works.

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Smethwick and the Mond Gas Bill.—At the last meeting of the Smethwick Town Council, the Finance Committee reported that the cost of opposing the Mond Gas Bill was £1004 13s. 8d. They recommended that the Gas Committee be requested to increase their promised contribution in relief of the rates by the sum of £1016, in order to cover the expense incurred.

Abercarn Gas Purchase Question.—It was stated in the "JOURNAL" for the 26th ult. (p. 1387) that, at a meeting of the ratepayers, it had been resolved that the Abercarn Urban District Council should promote a Bill for the compulsory purchase of the Gas and Water Company's undertaking. A poll was, however, demanded; and the result of this has now been made known—the figures being 1146 in favour of the Bill, and 555 against.

Unfounded Allegations against Alderman Geen, of Stoke.—At the meeting of the Stoke-upon-Trent Town Council last Thursday, Mr. Mellor, in accordance with notice, moved—"That Alderman Geen be requested to resign the chairmanship of the Gas Committee." His first argument against Mr. Geen retaining the chairmanship was by reason of his connection with the Coalowners' Association. The second was his connection with Hardmans, Limited, who were large buyers of residuals from the gas-works. The motion having been seconded by Mr. Ernest Brooke, Alderman Geen said the mover of the resolution had made a number of innuendoes, but he had not come with any information upon which his charges could be founded. To say that he (Alderman Geen) was an official of the Coalowners' Association was an absolute mis-statement. He had never during his connection with the Corporation known who was going to tender for the supply of coal, nor had he at any time known the price that was to be quoted. Though he was a shareholder in Hardmans, Limited, he was occupying a perfectly legal position, and he took good care that the Corporation did not suffer in any shape or form. Mr. Harding moved, as an amendment—"That the Council hereby expresses its unabated confidence in Alderman Geen as Chairman of the Gas Committee, and regrets that frivolous and unsustained charges should be made against him." The amendment was carried by 17 votes to 3.

The Grays District Council are about to supply electric current in artisans' houses on the penny-in-the-slot principle. For 1d., one-sixth of a unit will be supplied.

The Bingley District Council have resolved, on the recommendation of the Gas Committee, to take over the Cullingworth Gas-Works as from the 31st inst.

The Directors of the Maidstone Gas Company have notified their intention to reduce the price of gas from 2s. 8d. to 2s. 6d. per 1000 cubic feet as from Jan. 1 next.

An electrical exhibition was opened at the Royal Aquarium on Monday last week. The exhibits include switch-boards, electrical heating and cooking devices, generators, accumulators, lamps, and ordinary and prepayment meters.

An anti-bursting chamber for use on water-pipes exposed to danger from freezing is described in a pamphlet published by the Anti-Bursting Pipe Company of Pittsburg. A number of interesting experiments made with the device are explained.

The New Swindon Gas Company have recently placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for a telescopic holder 120 feet by 28 feet. Mr. Vale, of Stourbridge, has secured the contract for the construction of the tank.

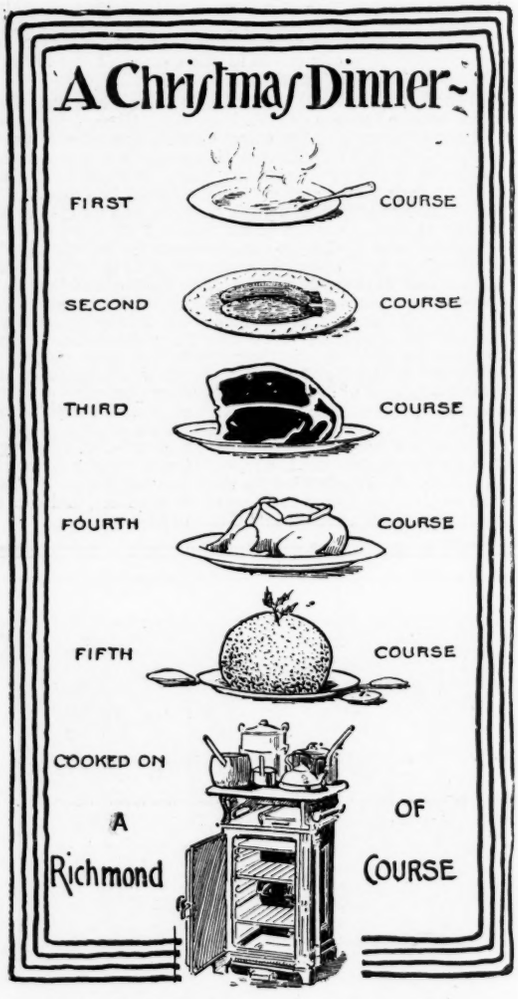
The Longtown Rural District Council have considered tenders for laying 31 miles of pipes, making connections, &c., for carrying out a water supply scheme for the district. They varied in amount from £10,317 to £17,537. The lowest offer—that of Messrs. Drummond and Sons, of Dumfries—was accepted.

The attention of investors may be called to the announcement in our advertisement columns that the South Metropolitan Gas Company are inviting tenders for £62,035 of 3 per cent. perpetual debenture stock at a minimum price of £90 per £100 of stock. The Lambeth Water Company are also offering £100,000 of 3 per cent. debenture stock, redeemable at par after the expiration of 25 years.

The Corporation of Glasgow have accepted the tender of Messrs. Robert M'Alpine and Sons, of Glasgow, for the erection of a bridge under Garngad Road, to carry a branch line from the Caledonian Railway into the new Provan Gas-Works of the Corporation. The contract will include the steel work of the bridge, the widening of a portion of the road, and the erection of boundary walls. The amount of the tender is £5484. The same firm are contractors for a large portion of the work in connection with the Provan station.

At the last meeting of the Rhyl Urban District Council, a unanimous resolution of the Gas and Water Committee to increase the salary of the Engineer (Mr. Leonard G. Hall) by £100 per annum, was approved. The addition is to take effect from April 1, 1902, and it will include commission for preparing the plans for, and superintending the construction of, the new water reservoir, and any additional works, whether for the water or the gas undertaking. Mr. Hall undertakes to continue his services at the advanced salary until the completion of the contemplated reservoir.

With a view to contrasting the street lamp ordinarily in use with the incandescent lamps which have lately been adopted for lighting the City Bridges, an inspection of the two systems took place on Monday last week; the Streets Committee, accompanied by Mr. F. G. Painter, the Chairman, making a tour of the bridges, under the escort of Mr. S. W. Morris, the Chairman of the Bridge House Estates Committee. We learn from the "City Press" that the evidence afforded of the success achieved by the incandescent system was conclusive. The ordinary lighting was, as it were, but a mere glimmer compared with the brilliant illumination afforded by the new lamps. Under the arrangement of the Bridge House Estates Committee, the lamps are maintained by the contractors; the Committee paying a fixed sum annually for the purpose. Our contemporary thinks the visit of the Committee will strengthen the opinion of those who contend that in incandescent gas is to be found the solution of old-standing problem as to the lighting of the side-streets of the City.



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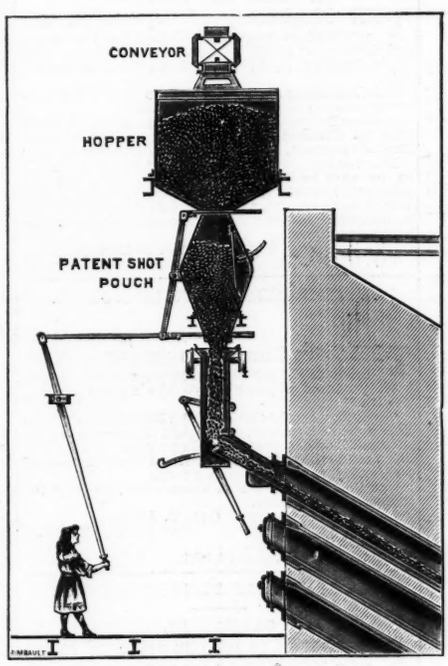

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FOREMAN.
SULPHURIC ACID AND SULPHATE OF AMMONIA WORKS.

WANTED, a General Foreman for a large Sulphuric Acid and Sulphate of Ammonia Works. Must be a thoroughly competent man, and have held a similar appointment elsewhere.
Applications, stating Age, Experience, and Wages required, and accompanied by Testimonials, to be forwarded not later than Saturday, Jan. 4, 1902, to No. 3793, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS MANAGER.

THE Directors of Kelso Gas Company invite APPLICATIONS for the post of MANAGER of their Works, which will be vacant shortly. The Applicant must be qualified to keep books and accounts. Salary £150.
Applications, giving full particulars of the Candidate's Age and Experience, accompanied by printed copies of Testimonials, must be lodged on or before Saturday, Dec. 28, 1901, with David W. B. Tait, Esq., W. S., Kelso, Secretary of the Company.
Canvassing not allowed.
Kelso, Dec. 16, 1901.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

THERE is a Vacancy at one of their largest Gas-Works for a RESIDENT SUPERINTENDENT. Preference given to one experienced in the working of Inclined Retorts and Regenerative Furnaces.
Commencing Salary, £400 per annum.
Applicants must not be under 30 years of Age, and should apply (before Jan. 2), by letter, stating qualifications and enclosing References, to the ENGINEER, City Gas-Works, Saltley, BIRMINGHAM.

CITY OF CARLISLE.

APPOINTMENT OF GAS MANAGER.

THE Corporation of Carlisle are prepared to receive APPLICATIONS for the appointment of MANAGER of their Gas-Works.
Candidates for the Appointment may obtain a statement of the duties of the Office and Conditions of Candidature on application to the Town Clerk, Carlisle.
The Candidate to be appointed must be a duly qualified Gas Engineer and Manager, not exceeding 45 years of age, and will be required to devote his whole time to the discharge of the duties of his office.
Preference will be given to Candidates having a practical knowledge of the manufacture of Carburetted Water Gas.
The Salary will be £350 per annum clear of all expenses, with the privilege of taking not more than two Pupils at any one time. The Corporation will provide Offices and necessary Staff.
Canvassing Members of the Council, either directly or indirectly, is strictly prohibited.
Applications, accompanied by printed copies of not more than Six recent Testimonials (which will not be returned), to be addressed to me the undersigned Town Clerk, marked "Appointment of Gas Manager," on or before the 4th day of January next.
By order,
A. H. COLLINGWOOD,
Town Clerk.
Carlisle, Dec. 10, 1901.

SHARES Wanted in C. & W. Walker, either Preference or Ordinary.
State Number for disposal and Price required to No. 3791, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-Hand Ammonia LIQUOR CONCENTRATION PLANT. Capacity, 240 gallons per hour.
Send full Particulars, to No. 3794, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—
GASHOLDER (and Cast-Iron Tank), 17,500 cubic feet capacity.
CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.
Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.
Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

FOR SALE, Cheap, for immediate removal—
Set of Four 12 feet square PURIFIERS, Centre-Valve, and 12-inch Connections.
ROTARY WASHER, 12-inch Connections and Three Valves, Engine, and Gearing.
ROUND STATION METER, 12-inch Bye-Pass Valve and Connections.
12-inch Patent PEEBLES SAFETY GOVERNOR.
The whole just recently replaced by larger Apparatus.
For Prices or further Particulars, apply to
F. C. HUMPHRYS.
Gas-Works, Ilkeston.

MANCHESTER CORPORATION GAS DEPARTMENT.
(ROCHDALE ROAD STATION.)

PURIFIERS FOR SALE.

OWING to alterations, the Gas Committee have FOR SALE Six PURIFIERS, 27 ft. 6 in. by 21 ft. 6 in. by 5 ft. 9 in., together with Valves, Wrought-Iron Girders, Cast-Iron Columns, &c.
Intending Purchasers may inspect same on application to Mr. J. G. Newbigging, C.E., at his Office, Rochdale Road Station.
Specification and Form of Tender may be obtained on application to Mr. C. Nickson, Superintendent, Gas Department, Town Hall, Manchester.
Tenders, endorsed "Removal of Purifiers," and addressed to the Chairman of the Gas Committee, Town Hall, Manchester, to be delivered not later than Ten a.m. on Saturday, the 25th of January, 1902.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
Dec. 19, 1901.

THE Directors of the Ilford Gas Company are prepared to receive TENDERS for the supply of 1000 6-inch PIPES, delivered either f.o.r. Ilford Station or f.a.s. the Company's Wharf, Ilford.
Tenders, to be sent in not later than Dec. 30, to be addressed to J. H. BROWN, Engineer and Manager, Gas-Works, ILFORD.

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are prepared to receive TENDERS for the supply and delivery of 80,000 Tons of best GAS COAL from the beginning of April, 1902, until the end of December, 1902.
The Magistracy reserve the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Kjöbenhavns-Belysningsvæsen, Vestre-Boulevard, Köbenhavn B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Magistratens, 4de Afdeling, Det nye Baadhus, Köbenhavn B, before the 6th of January, 1902, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.
THE MAGISTRACY OF COPENHAGEN.
Dec. 14, 1901.

CLACTON URBAN DISTRICT COUNCIL.

TAR.

THE above Council are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works for the ensuing Twelve Months.
Particulars can be obtained from Mr. Sydney Francis, the Council's Engineer, Town Hall, Clacton-on-Sea.
Sealed Tenders, endorsed "Tender for Tar," to be delivered to the undersigned not later than Four o'clock on Monday, the 6th of January next.
The Council do not bind themselves to accept the highest or any Tender.
GEO. T. LEWIS,
Clerk to the Council.
Town Hall Buildings,
Clacton-on-Sea, Dec. 17, 1901.

CLACTON URBAN DISTRICT COUNCIL.

GAS-METERS.

THE above Council are prepared to receive TENDERS for the supply of PREPAYMENT and ORDINARY GAS-METERS.
Full Particulars can be obtained upon application to Mr. Sydney Francis, the Council's Engineer, Town Hall, Clacton-on-Sea.
Tenders, sealed and endorsed "Tender for Meters," to be delivered to the undersigned not later than Four o'clock on Monday, the 6th of January next.
The Council do not bind themselves to accept the lowest or any Tender.
GEO. T. LEWIS,
Clerk to the Council.
Town Hall Buildings,
Clacton-on-Sea, Dec. 17, 1901.

TO TAR DISTILLERS.

THE Marlborough Gas Company are prepared to receive TENDERS for the purchase of TAR produced at their Works, for Twelve Months from the 1st of January, 1902, loaded into Contractor's Tank-Waggons, G.W.Rly.
HENRY POND,
Secretary.
Gas Offices, Marlborough.

CITY OF LOUVAIN.

LIGHTING CONTRACT.

THE Period within which Proposals will be received for Lighting the City of Louvain by Gas or Electricity, or by a combination of the two Systems, has been EXTENDED from Dec. 31, 1901, to Feb. 19, 1902.
Proposals, marked "Lighting Contract," to be addressed to the BURGOMASTER, Louvain, BELGIUM.

CITY OF RIPON.

THE Gas Committee are prepared to receive TENDERS for the supply of BENZOL during the Year 1902.
For Particulars, apply to the Gas Manager.
By order,
M. KIRKLEY,
Town Clerk.
Town Hall, Ripon,
Dec. 17, 1901.

CORPORATION OF ROTHERHAM.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY, RETORT, BRICKS, CLAY, &c.
Particulars can be obtained on application to the Engineer, Mr. Frank A. Winstanley.
Tenders, endorsed "Fire Goods," to be delivered to me on or before Monday, Jan. 6, 1902.
The Committee do not bind themselves to accept the lowest or any Tender.
H. HAMPTON COPNALL,
Town Clerk.

BOROUGH OF NELSON.

THE Gas Committee are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS
Specification and Form of Tender may be obtained on application to Mr. A. J. Hope, Engineer and Manager, Gas-Works, Nelson.
Tenders, endorsed "Fire Clay Goods," and addressed to the undersigned, must be received not later than Jan. 20, 1902.
The Committee do not bind themselves to accept the lowest or any Tender.
J. H. BALDWICK,
Town Clerk.
Town Hall, Nelson,
Dec. 16, 1901

JOHANNESBURG MUNICIPALITY.
MUNICIPAL NOTICE No. 97.

CARBURETTED WATER GAS PLANT.

TENDERS are invited for the supply and delivery of a complete CARBURETTED WATER GAS PLANT of a capacity of about 200,000 cubic feet daily.
Specification with general Plan of present works, can be obtained on application, from the Crown Agents for the Colonies, Downing Street, London, or from the Town Clerk, Johannesburg.
Tenders in sealed envelopes, marked on the outside "Tender for Carburetted Water Gas Plant," to be received by the Town Clerk, Johannesburg, on or before Jan. 31, 1902.
The lowest or any Tender not necessarily accepted.
LIONEL CURTIS,
Acting Town Clerk.
Johannesburg, Nov. 4, 1901.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK only, WILL BE CLOSED on the 20th inst., and RE-OPENED on the 1st of January, 1902.
By order of the Board,
WILLIAM E. ROBERTS,
Secretary.
63, Chancery Lane, W.C.,
Dec. 19, 1901.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF EXTRAORDINARY GENERAL MEETING OF SHAREHOLDERS.

NOTICE is Hereby Given, that an EXTRAORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Company's Offices, Commercial Road, Portsmouth, on Thursday, the 16th day of January, 1902, at Three o'clock in the Afternoon, on the following Business:—
To consider, and if thought fit to approve, the Draft of a Provisional Order for which an application has been made to the Board of Trade under the Gas and Water Works Facilities Act, 1870, to be confirmed subsequently by Parliament, intituled "A Provisional Order empowering the Borough of Portsmouth Water-Works Company to raise Additional Capital and to construct additional Works, and for other purposes," a printed copy of which Draft Provisional Order will be deposited at the Office of the Board of Trade on or before the 23rd day of December, 1901.
Dated the 12th day of December, 1901.
By order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.
Offices: Commercial Road,
Portsmouth.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO BE SOLD by Auction, in the Board Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 21st of January, 1902, at Half-past Twelve o'clock precisely, by

MR. CHARLES A. JOEL,

in such Lots as are provided for in the Company's Act of 1894—

FIFTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894.)

(or thereabouts), being such amount as will make up, with the Premiums thereon, the balance of Preference Stock authorized to be issued under such Act.

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne.
Dec. 17, 1901.

LAMBETH WATER-WORKS COMPANY.

NOTICE is Hereby Given, that it is the intention of the Company to SELL BY TENDER £100,000 THREE PER CENT. DEBENTURE STOCK redeemable at par at the option of the Company on Six Months' Notice at any time after the expiration of 25 Years from the date of issue.

Particulars, Conditions of Sale, and Forms of Tender may be obtained at the Company's Office, Brixton Hill, S.W.

Sealed Tenders are to be delivered at the said Office not later than Twelve o'clock (noon) on Monday, the 6th of January, 1902.

By order,
H. WILKINS,
Secretary.

Brixton Hill, S.W.,
Dec. 3, 1901.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £62,035 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £90 per Cent.

NOTICE is Hereby Given that, it is the intention of the Directors of this Company to sell by TENDER £62,035 THREE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Acts, 1882 and 1896.

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Tuesday, the 14th day of January, 1902.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower Price than at the rate of £90 money for each £100 Debenture Stock.

By order,
FRANK BUSH,
Secretary.

Offices: 709, Old Kent Road,
London, S.E., Dec. 14, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £10,000 ADDITIONAL "B" CONSOLIDATED STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 14, 1902, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GUILDFORD GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 14, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Just Published, Price 1s. Post Free.

A MEMORANDUM
ON THE

MOND GAS SCHEME

By F. N. KEEN,
Of the Middle Temple, Barrister-at-Law.

The Pamphlet contains a Summary of the Principal Provisions of the South Staffordshire Mond Gas (Power and Heating) Company's Act, 1901, and of some of the matters raised in evidence before the Parliamentary Committees that dealt with the Bill.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
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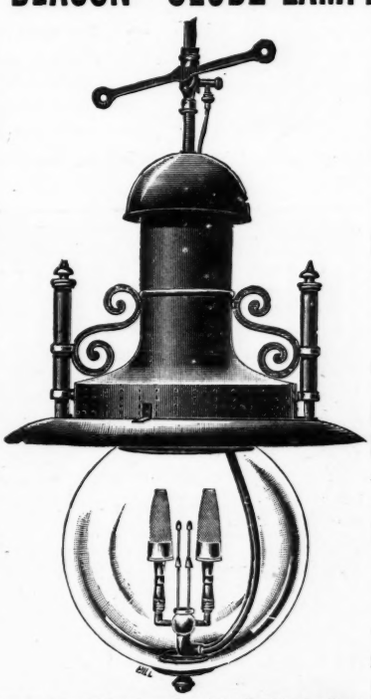
THE PATENT
"BEACON" GLOBE LAMP.



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Highest Results in Gas, & Excellent Coke.

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LIMITED,
NEWBATTLE COLLIERIES,
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Gas Companies are solicited to try Samples of the

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BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY
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JOHN HALL & CO.,
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Manufacturers of
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RETORTS CAREFULLY PACKED FOR SHIPMENT.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
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Maintains a High Standard in Residuals.

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Hot Bath for ¾d. in Five Minutes.
Boiling Water in a Single Minute.
EWART'S
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For Gas or Oil.
Always in action at
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ESTABLISHED 1820.
SULPHURIC ACID.

MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

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Head Office: Miles Platting, MANCHESTER.
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NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

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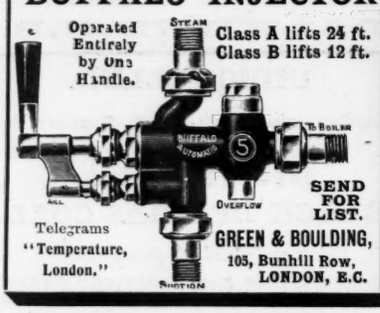

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Class A lifts 24 ft.
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JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·5 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE, SON & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE,
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.
Prices are Reduced.

CRESSWELLS' ASBESTOS CO., LTD.
WELLINGTON MILLS
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Asbestos Spinners and Manufacturers.
Telephone No. 950. Tels.: "ASBESTOS, BRADFORD."
If you have no prejudices in the way of Non-Conductors for your Boilers and Steam-Pipes, consider our Trade Makes,
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They are Good, Better, Best. Ask for No. 4 Catalogue.
Applications for Colonial and Foreign Agencies desired.

J. FIRTH BLAKELEY & CO.
Gas Engineers, &c.,
Thornhill, DEWSBURY.

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They are fitted with perforated intercepting Baffle Plates and Water arrangement.
Cheap in construction; thoroughly efficient.
Large Stock of good Second-Hand Gas Plant.
Telegrams: "BLAKELEY, THORNHILL LEES."

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"A VERY SIMPLE & INGENIOUS APPARATUS."—VIDE "THE ENGINEER" NOV 12TH 1897
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Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
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"Copper" Arc Lamp,
TO SUIT
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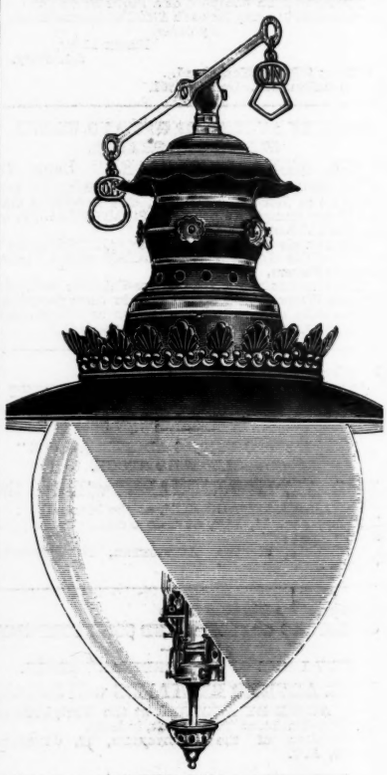

J. & W. B. SMITH,
21 & 23, FARRINGDON ROAD,
LONDON, E.C.

THE CLAMOND GAS RADIATOR

The Perfection of Gas-Fires.

THE CLAMOND GAS RADIATOR

1. Gives the HIGHEST HEATING EFFICIENCY.
2. Ensures PERFECT COMBUSTION.
3. Does not vitiate the Atmosphere.
4. It is easy to manipulate, and has no parts to get out of order.

ORDER THE CLAMOND GAS RADIATOR.

Because

It keeps a Pure Atmosphere in your Room.

Because

It keeps your Rooms free from Dirt, Dust, and Smoke.

Because

It is Cheaper than a Coal Fire.

Because

It makes a Bright, Cheerful Fire.

Because

It saves Labour, Money, and Health.

THE CLAMOND GAS RADIATOR

THE PERFECTION OF GAS HEATING.

THE CLAMOND GAS RADIATOR

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Prices and Analysis of all the Scotch Cannels on Application.

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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
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MANUFACTURERS OF
Inclined, Horizontal, and Segmental
GAS-RETORTS,
Fire-Bricks, Fire-Clay,
Lumps, and Tiles
OF EVERY DESCRIPTION.
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Telegraphic Address: "MOORES, LYE." Telephone No. 23 Lye.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING
GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Dec. 3, p. 1589.]

STOKER'S GLOVES.
GEO. BOULTON & SON, Wholesale Glove Manufacturers, **75, Goswell Rd., London, E.C.**
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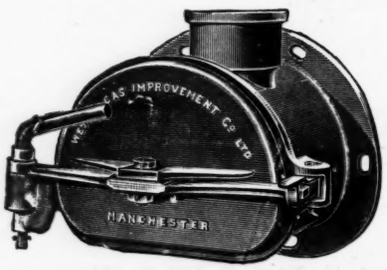

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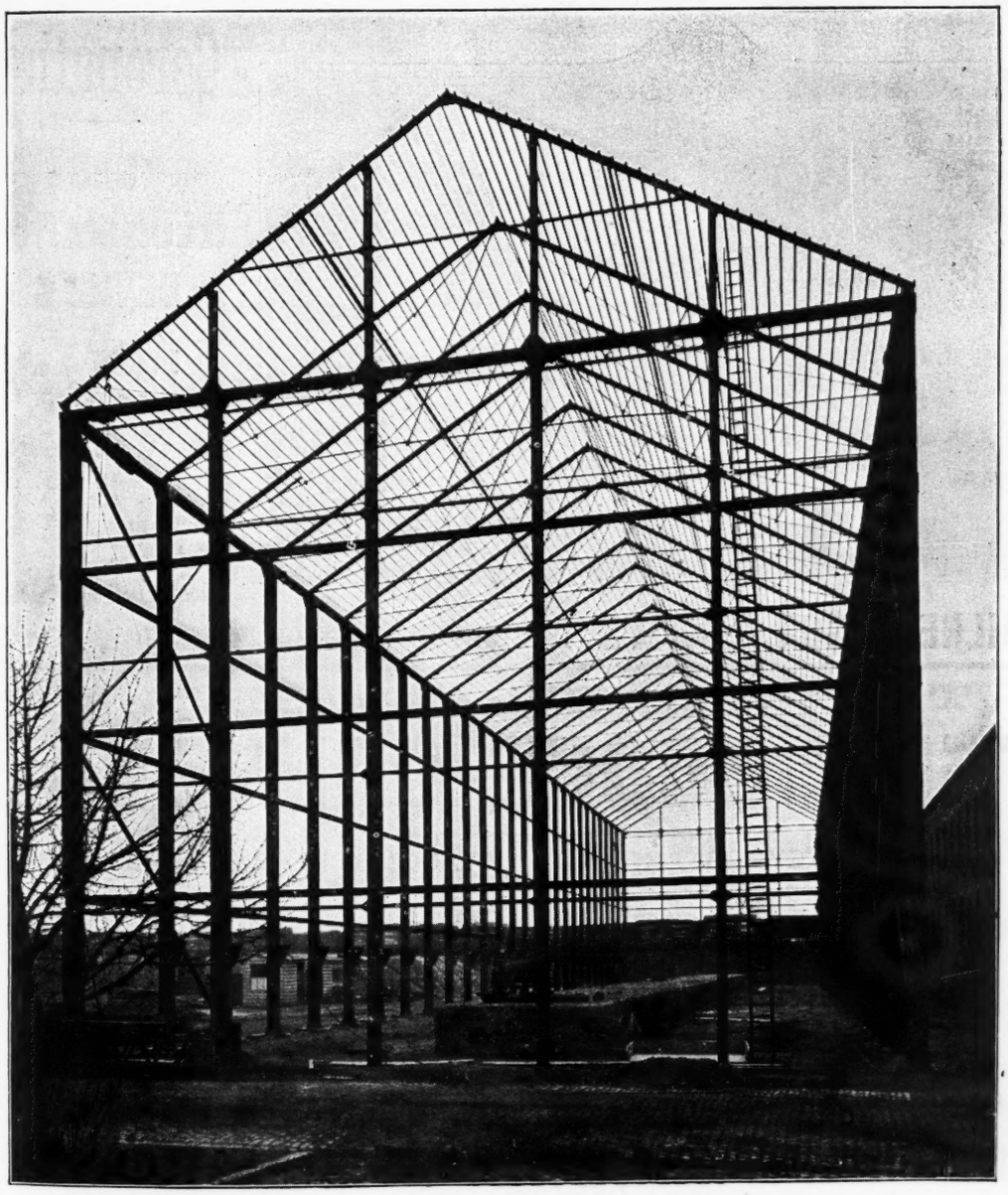

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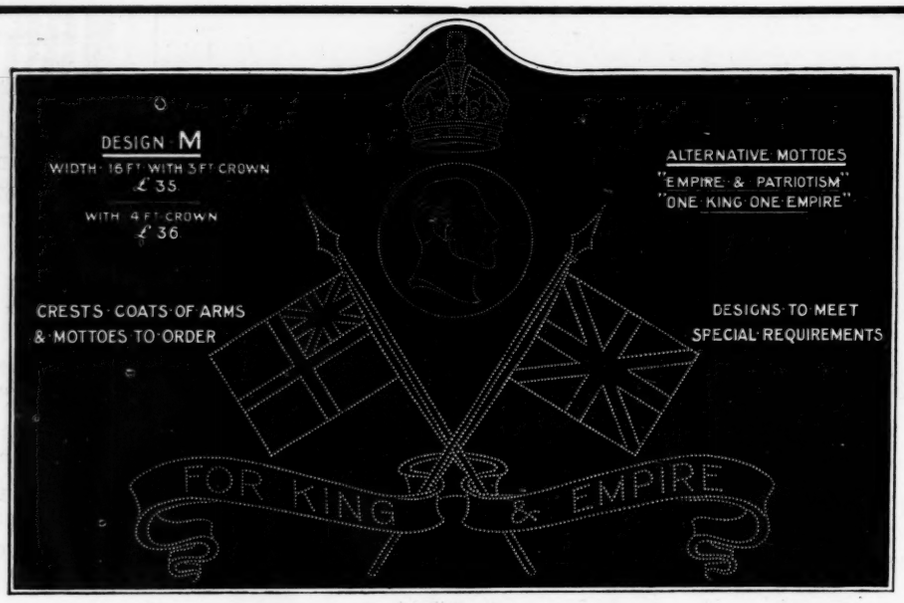

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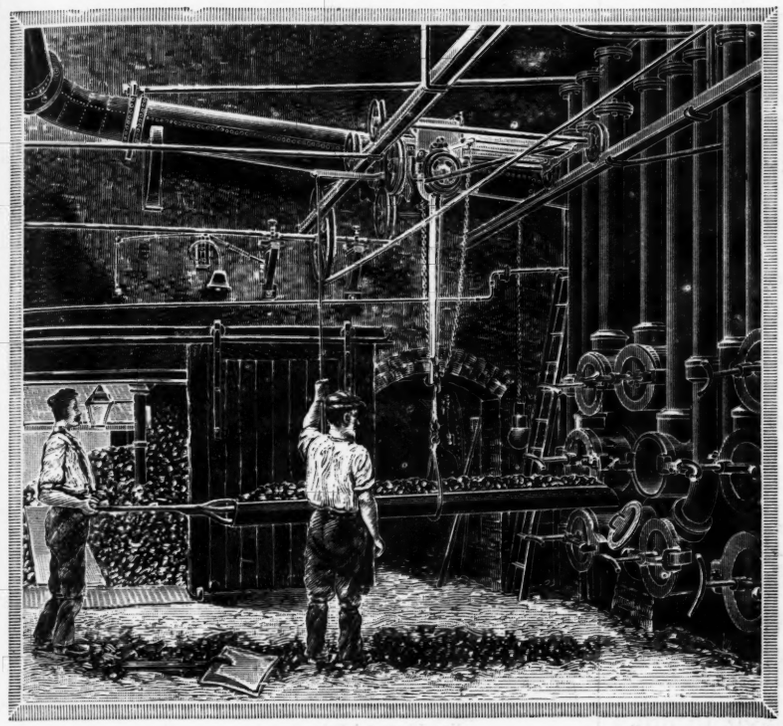

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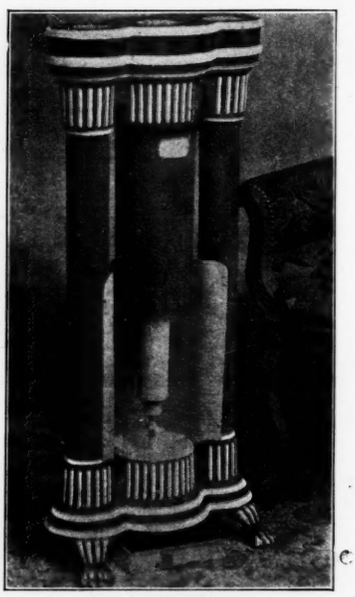

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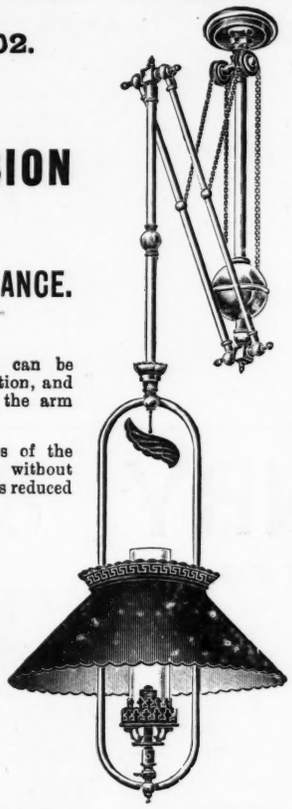

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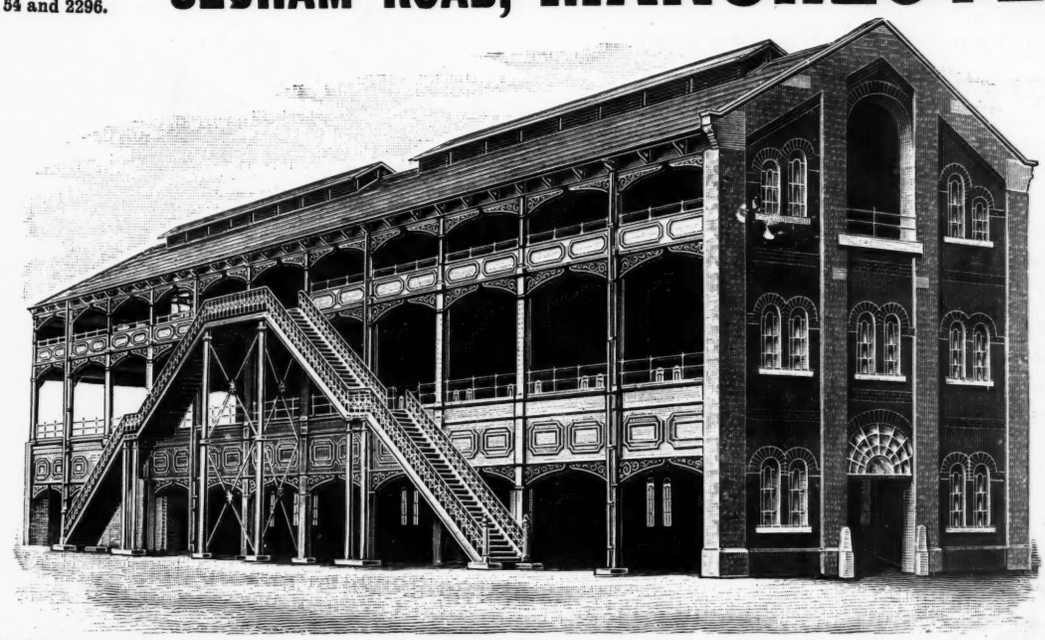

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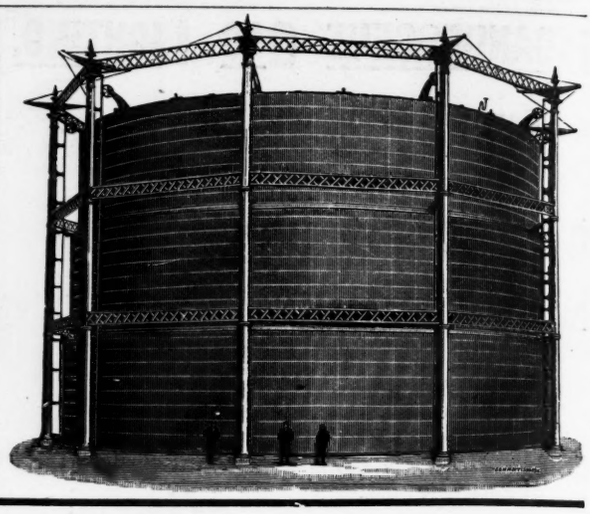

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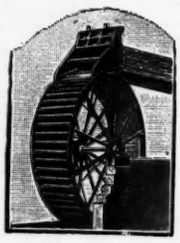

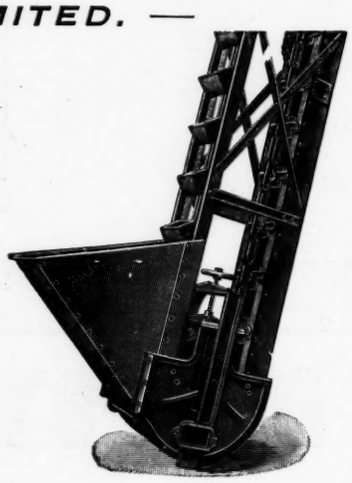

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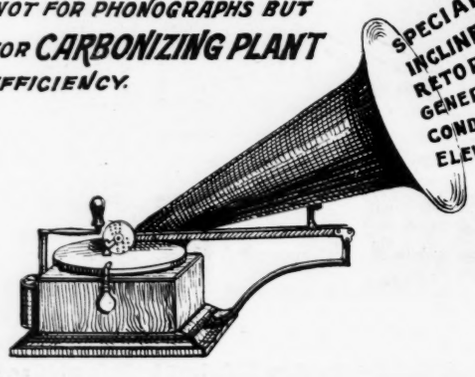

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